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ORIGINAL ARTICLES

EARLY TREATMENT OF MALOCCLUSION*

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ORTHODONTIA of the permanent teeth will always be needed because of the neglect and procrastination that accompany inexperienced parenthood. It has lost its principal interest for me, because I see before me the possibility of preventing the necessity for such orthodontia, and because I see the possibility of helping to develop the enamel coating of the teeth in such a manner as will prevent the great prevalence of cavities that usually show themselves in childhood, and then, after protracted neglect, appear in adult life in the form of extensive cavities that require attention during the remainder of life if one wishes to keep even with the ravages of decay resulting from defective enamel in childhood.

All abnormalities among deciduous teeth indicate crowding *somewhere,* therefore enlargement of the entire arches of deciduous teeth is always necessary if we try to accomplish regularization of the incoming permanent teeth by using deciduous teeth to accomplish that result.

The second deciduous molars should be 35 mm. apart; 28 mm. as a minimum width is empirical and only to be adhered to until a more scientific pronouncement becomes possible. Narrow dental arches are always symptomatic of past or present arrest in development of the child.

We want to know if we can cause acceleration of development, so as to overtake in some measure what has been lost during the arrest. If so—how? And we want to know the best way to retain whatever development we shall have obtained, including any superdevelopment, which has hitherto been deemed unattainable.

It must be remembered that developmental processes always recommence,

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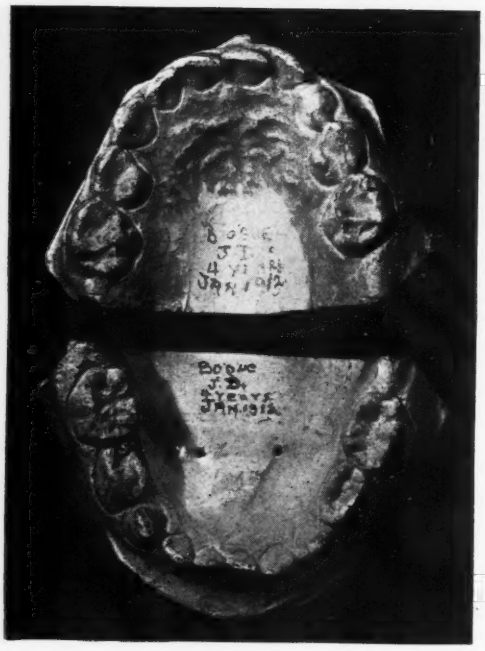

Fig. 1.—Case before treatment in 1912.

Fig. 2.—Condition of teeth in 1915.

Fig. 3.—Development of case in 1919.

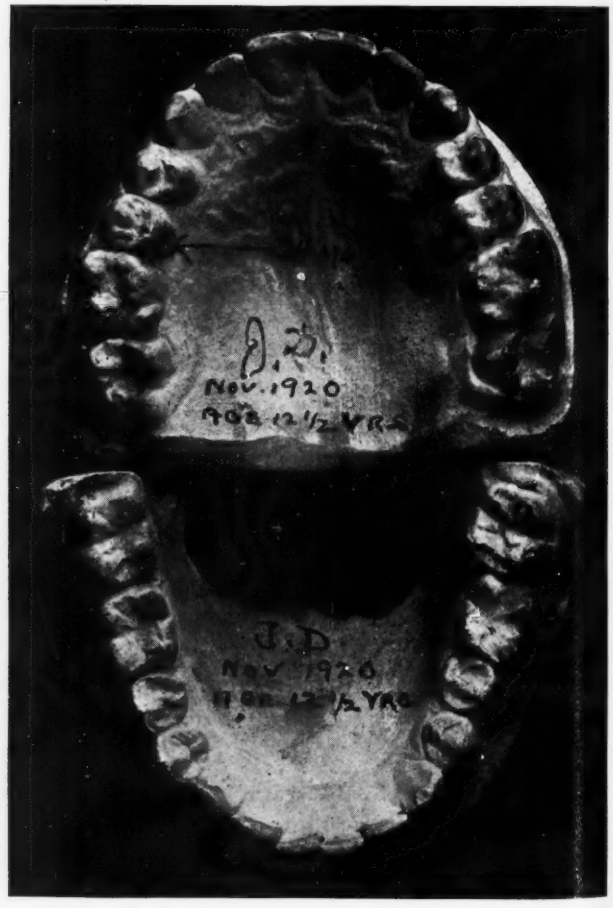

Fig. 4.—Condition of teeth in 1920.

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6.

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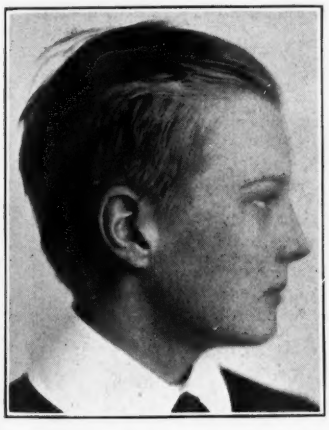
Figs. 5, 6, and 7.—Facial development at the time model in Fig. 1 was made.



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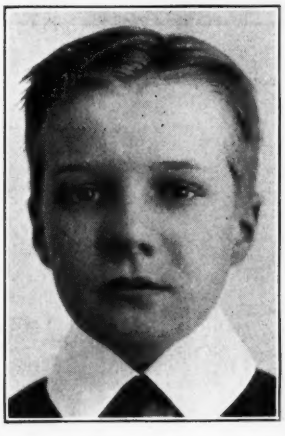

9.

10.

Figs. 8, 9, and 10.—Facial development at the time model in Fig. 3 was made.

11. 12.

Figs. 11 and 12.—Showing the improvement from 1912 to 1915. Compare Fig. 12 with Fig. 13 for changes occurring from 1915 to 1919.

if they recommence at all, at the point where they left off or where they originally stopped.

There are three well-known means of aiding in the renewal of the developmental process.

Proper food and exercise is one method; the administration of thyroid or

13. 14.

Figs. 13 and 14.—Illustrating the development from January, 1919, to November, 1920.

Fig. 15.—Arches showing lack of development of patient age five and one-half years.

Fig. 16.—Same case as shown in Fig. 15 after one year of treatment.

other glandular extracts is another; and a mechanical spreading of the dental arches combined with the preceding methods is the third.

It is evident that growth should be promptly renewed in all cases of arrested development because the greatest growth of the brain takes place between birth and six years of age during which period the average increase in size of the brain should be 989 grams while during the period from six to nine-

Fig. 17.—Same case as shown in Fig. 15. Patient nine years two months.

Fig. 18.—Shows case at the age of twelve years after the second molars had erupted.

19.

20.

Figs. 19 and 20.—Side view of models. Fig. 19, patient at the age of five and one-half years. Fig. 20, patient at the age of six and one-half years.

21.

22.

Figs. 21 and 22.—Side view of models. Compare with Figs. 19 and 20. Fig. 21, patient at the age of nine years and two months. Fig. 22, patient at the age of twelve years and four months.

teen years of age, the average increase in weight of brain is only 40 grams.

If mechanical spreading is one of the methods adopted to promote the renewal of growth, this should be done if possible before six years of age; because the lingual root of the maxillary deciduous molar becomes so absorbed

Fig. 23.—Treatment begun at five and one-half years. Note progressive development to fourteen years of age.

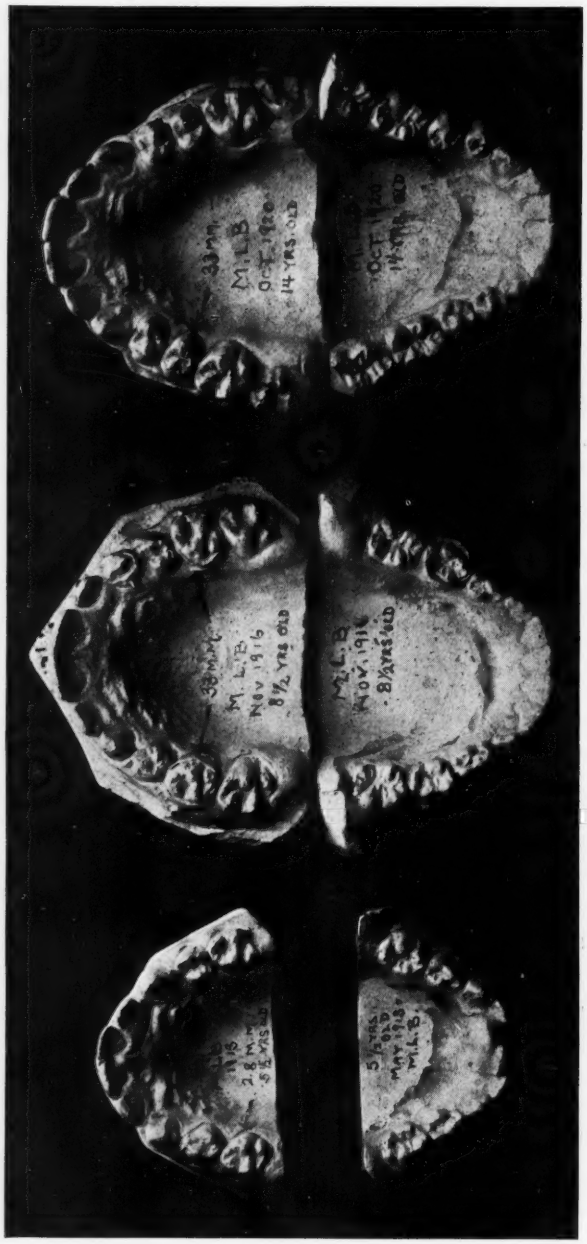

Fig. 24.—Same case as Fig. 23. Note the increase in width in the region of the first deciduous molars as shown in first and second model. Also there has been no increase in width from the second to third model.

that this tooth, when moved, can no longer carry with it the crown of the premolar.

When the little undeveloped arches of the child are mechanically enlarged the very fact of their enlargement brings with it a stimulus to growth by the removal of obstructions to growth which have, up to this period, existed. The heart thus has freer action for its circulatory processes for the deposition

of bony matter, where heretofore there was no room, and for the enlargement up to normality of the adjoining bones and soft parts comprising nose and face and often even the orbital processes. Even the skeleton of the body below feels the impulse of the fuller circulation caused by an unimpeded heart action in an ample thorax.

Fig. 25.—Models showing progressive changes resulting from early treatment.

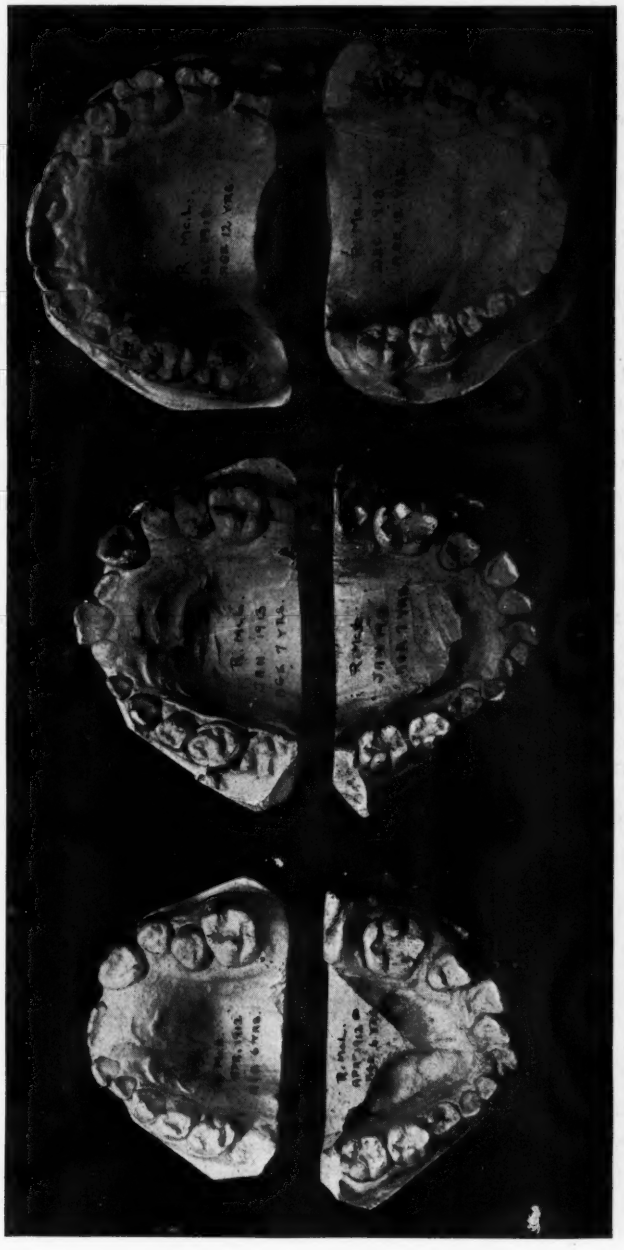

Fig. 26.—Three models of a case made at six, seven, and twelve years, showing changes resulting from early treatment.

The size of the child's brain at birth and the marvellous growth that normally occurs between birth and the sixth year, seems to call for all the added growth that we can procure in cases where we undertake to enlarge diminutive baby arches.

I present three cases illustrative of what I have read, all of them having been begun by using the deciduous teeth as instruments for spreading.

The third case is that of a little girl, one of several children in the same family, all begun and finished by using the deciduous teeth only.

DISCUSSION

Dr. Oscar Carrabine, New York City.—Dr. Bogue asked me to discuss his paper and be unmerciful in my attack upon him.

He said, "it is probably the last paper I shall ever write upon this subject."

If that is so gentlemen, we have had a special privilege here today that the future meetings of this Society will never have.

Dr. Bogue is the one man prominent in orthodontia, who has come out openly for treatment of cases before the sixth year.

As the years go by we will more and more realize the great value of this paper, and I feel that this paper is Dr. Bogue's heritage to future generations.

It is difficult to criticize anything he has said, whether he is right or wrong, time only will tell.

Dr. Lawrence W. Baker, Boston, Mass.—Dr. Bogue's paper is a masterpiece. I am not going to attempt to discuss it. I should not dare to change a thought of it any more than I should attempt to alter a line of Gray's Elegy or to add a stroke of the brush to a Sargent. It is a master message from the first generation to the fourth generation. I hope you young men, members of this fourth generation, will take these ideas and thoughts that have been advanced by Dr. Bogue and ponder them long and carefully, remembering in doing so, that Dr. Bogue is the father of early treatment, yes, he is the grandfather, or, to be more exact, he is the great grandfather of early orthodontic interference.

I well remember when I was a child that Dr. Bogue, on his pilgrimages to Boston, usually paid a visit to my father's home and then I had the rare privilege of sitting on his knee and hearing him discuss with my father the germ of the principles which he has expounded here today. Many of us older members present remember how his doctrine of early treatment was criticized, in fact, he was ridiculed and called a crank. But we all have to admit we have learned from him, and now regard early treatment as one of the foundation stones of modern orthodontia.

There is just one more thought I wish to voice, and I am glad Dr. Bogue is here to hear it, for it is this: if my little investigations on the influence of the forces to occlusion on the development of the skull, are of any value, we have to thank Dr. Bogue, for he stimulated me to carry on this work—he did not tell me to do thus and so, but it certainly was his influence that started me in this line of investigation.

Dr. Frank A. Delabarre, Boston, Mass.—As you may perhaps know, I have long been an adherent of the principles Dr. Bogue has presented to you this morning—the idea of early treatment of malocclusion. I will not bore you with any repetitions, but simply give you my impression of the presentation of today's paper by Dr. Bogue. I think it is very valuable. You are working in orthodontia to attain a result. What it is? The establishment of normal occlusion. I sometimes fear that you do not realize your opportunities or possibilities in the treatment of this disorder. The establishment of normal occlusion should be only an incident in the pursuit of your ideal. You should look farther and try to secure all of the benefits that may accrue to your patient through the establishment of normal occlusion, with a comprehension of their breadth and of the influence not only on the physical health of the individuals, but also on their mental caliber as well.

In studying Dr. Bogue's cases at his chair and in his office and reviewing the numerous models he has, covering a long period of years of treatment of individual cases, it has struck me that Dr. Bogue's appreciation is the important thing in undertaking a case for treatment, not only establishing normal occlusion but attempting to give the patient better physical health and a higher mental capacity. He has not worked alone, but has solicited

the aid of specialists in other branches of the healing art to help him in his work. This is a most broad-minded conception of his responsibilities toward his patients. There is no question whatever but what the results he gets in these respects are magnificent. I would emphasize in particular the wonderful changes that take place in the mental aspects of the case. In treating these children, if we can relieve them from the pathologic pressure in this particular region that is responsible for peripheral nerve irritations, as manifested in a small sense in the everyday disposition of the children in their relation to their associates, where they are cross and peevish and intractible, up to the more severe forms of mental disturbances that are expressed even in the insanities, we can accomplish much. These are phases of our work. It is well recognized that these local peripheral irritations cause these graver disturbances, and by removing them through the establishment of normal occlusion we get relief from St. Vitus dance, from epilepsy, from dementia precox, it makes our work more worth while, and I want you to appreciate that you are dealing not with the small problem of malocclusion alone, but you are dealing with the larger problem of the physiologic health of all the related organs and functions of the individual.

Dr. B. E. Lischer, St. Louis, Missouri.—I am entirely unprepared to discuss this very fine paper by Dr. Bogue. I am frank to say to Dr. Bogue in his presence, I believe the ideals that he has in mind and the work he has done along these lines are very much misunderstood and are not fully appreciated, and I think that as time goes on Dr. Bogue's work will rise higher and higher as a sort of mountain peak for us to look at, and we will all say: "After all, he was right."

I, like one of the other discussors, have undertaken to treat patients of four and five years of age only when they had severe deformities, when I felt a jaw deformity was imminent. I have in minor cases felt that we should let well enough alone and postpone treatment until some later time. However, I have never had a consultation of that kind but what I have strongly impressed upon parents that the case may need treatment, and in my opinion there will be an opportune time to treat the child, and that this *opportune time* must be decided by the man who is going to treat the case. And I always recommend regular visits of such cases to the office for subsequent observation.

Dr. Bogue has shown work here that opens up a new field of thought, because he has shown very clearly that these early treatments permit us to accelerate local development, which has a profound influence upon the general development of the child; and personally I want to thank him for his very interesting and instructive paper.

Dr. Edward A. Bogue, New York City, (closing).—Dean Smith, of the Dental Department of Harvard University, asked me one day to take his lecture hour to discuss Orthodontics of the deciduous teeth. Not a child's skull could be found in Boston, either in the dental or medical schools that had the alveolus cut away in front to show both permanent and deciduous teeth. I have had such a skull since 1894, and it furnishes much of the material that I have given you in this short paper. Fearing that skulls like this are scarce, I have felt a little shy of bringing some matters shown in that skull before a critical assembly like this, without the skull itself.

In 1917, three young men of my acquaintance were unable to pass the physical examination to get into the Army. Studying that skull led me to adapt appliances by means of which I spread the maxillary arch and nasal passages, and enlarged the thoracic cavities of all these three young men, and they all went into the Army. One lies dead in England. The two others have lately been at my house, and thanked me for what was accomplished in their behalf. The effect of these spreadings has been perceptible with all of them from head to foot.

The son of a surgeon was brought to me. I wanted to change his diet. The father replied, "Order what you like and you will get it." The mother had objected to any change in the boy's dietary, but acquiesced in what was asked of her. Some time later she walked in with her little girl saying, "I have come to tell you, in the first place, how grateful I am for what you have done for my boy. He has improved greatly mentally and physically. If you want impressions of my teeth, you are welcome to them, and my two

other children are at your disposal whenever you think best.'' I found the model of this mother's teeth only twenty-seven millimeters broad at the second premolar region across the upper arch. The arch of one of her children was broader than the mother's.

Now when I first began to notice, some years ago, that the width of the upper arch lay at the bottom of all plans for correction, I called Dr. Ottolengui to my side, and showed him the models of a case, and then showed him the models of the same case three or four months later. Dr. Ottolengui, you all know is a careful observer. He inquired, ''Do you think for a moment that your little wire arches have caused all this spreading at this growing period of the child's life?'' I replied by handing him a model of the same child taken exactly three years previously, together with a pair of compasses, and remarked, ''You will please answer that question yourself, Dr. Ottolengui.'' He measured the model taken three years before, then the model taken three or four months before, and looked up in astonishment. There was not a hair's breadth of difference. ''Now measure the one taken lately.'' He did so, and said, ''There is more than a quarter of an inch greater width in these last few months than there was at the beginning, or three years earlier.'' From that time to this, I suppose, many of us have been keeping track of the widths of the various arches upon which we place our appliances. That individual case was spread too much, but the lips speedily brought the over-enlarged arches back into contact with the lower teeth. The prevailing fault with our orthodontic work on permanent teeth, is that we stop short of sufficient enlargement to allow for the extra growth that takes place between twelve and from eighteen to twenty-four years of age, after the wisdom teeth shall have made their appearance.

One of my professional friends said, ''Dr. Bogue, I do not believe at all in the spreading of deciduous teeth before the permanent teeth shall have made their appearance. They ought to be watched carefully, yes, but I think spreading should all be done when the permanent teeth show that it is required.'' I replied, ''Yes, my dear Doctor, we differ in this respect, you watch that child on the track of an approaching train very carefully, but do not undertake to pull it off the track until after the train arrives, while I pull it off before the train arrives.''

STUDIES ON THE ETIOLOGY OF ANGLE'S CLASS II MALOCCLUSAL MANIFESTATIONS*

By Milo Hellman, New York

LIKE all other scientific investigations, the search for the causes of malocclusion of the teeth is steeped in difficulties of no slight degree. Unlike similar research in other fields of work, orthodontic investigation is rendered more exacting because of the frail structure of its fundamental principles. So much is taken for granted, so much is assumed, so much is claimed and so much is postulated, that it becomes a veritable task to extricate oneself from the maze of confusing hypotheses in the endeavor to establish a path paved with reliable and scientific evidence by which a definite goal may be reached.

Owing to these circumstances it is essential to approach this problem in a cautious and judicious manner. Thus, before entering upon the search for the cause, it is of utmost importance to determine with as much precision as possible what the nature of this malocclusal manifestation really is. Upon this will depend a clear conception of the scope of this study and its relationship to other, like problems. A broader aspect will then be gained of the significance of the undertaking which in turn will enable us to treat this subject with the care it deserves. To comply with these demands, it is advantageous to divide this topic under the following captions:

1. The biologic aspect of malocclusion of the teeth.
2. The classification of malocclusal manifestations.
3. The causes of malocclusion of the teeth from an historical aspect.
4. Observations on various factors associated with malocclusion of the teeth in general and Class II in particular.
5. An interpretation of the processes of growth in general and its application to the phenomena observed in Class II malocclusal manifestations.

Then, by summing up the evidence, conclusions can be reached that may in a large measure throw some light on the baffling problem on hand.

1. THE BIOLOGIC ASPECT OF MALOCCLUSION OF THE TEETH

Digressions from regularities of all life phenomena are manifest in the various aspects in nature. Plants as well as animals bear abundant evidence of this. The leaves and limbs of trees do not always develop with like regularities. The appendages of protozoa do not always present a strict adherence to uniformity. The shells of molusks quite frequently present aberrations from the natural order of events.

*Read at the Annual Meeting of the American Society of Orthodontists, at Atlantic City, N. J., April, 1921.

As regards teeth, similar occurrences may be observed. Thus the teeth of lower mammals are not always arranged in conformity with an ideal scheme. For example in the *Suidae* the maxillary incisors occupy a characteristic irregular position with spaces intervening, while the mandibular incisors are always exceedingly crowded. Those of the *Pecora* are found lapping each other. Class II (Angle) manifestations are found to occur in the dentition of the horse to the extent of 8 per cent in 58 horses examined. Also in lower apes occlusal anomalies were observed; as, in *Ateles Ater,* Class III. In the anthropoid apes they are found in various forms. For instance, from the rotation of a single tooth, mostly one of the premolars and to a less degree the maxillary second incisor, malocclusal manifestations were observed to present also deviations belonging to Class II (in the Orang) and Class III in the Chimpanzee.

It is therefore no exceptional incident that similar manifestations are also found in man. Malpositions of blood vessels and nerves are no uncommon occurrence. Anomalies in the morphology of bones, muscles and various other organs are also not infrequently observed. Why, then, should like manifestations also in the teeth not be expected? Depending as the teeth do on a complexity of factors in ontogenetic development, it is but natural that malformation, malposition and the consequent malocclusion should occur. That such occurrence is far from being infrequent all of you can attest. Heredity, environment, food, and disease each plays its rôle in the drama of malocclusion of the teeth.

The early forerunners of modern man bear abundant evidence of malocclusion of the teeth. Thus, paleolithic man already presents such abnormalities as may be identified with Class II. In the American Aborigines malocclusion of the teeth is not a very rare occurrence, and the Eskimo presents an unexpected frequency of it. The excessive manifestation of these abnormalities in modern man is therefore not surprising; because, all things endowed with life present phenomena resembling those manifested in malocclusion of the teeth in modern man.

2. THE CLASSIFICATION OF MALOCCLUSAL MANIFESTATIONS

Attempts have variously been made at sorting out the various forms of occlusal malrelationship of the teeth. Beginning with Joseph Fox (1803) arrangements into groups of like manifestations were made by Delabarre (1819), F. Maury (1828), Thomas Bell (1829), F. C. Kneisel (1836), Lefoulon (1841), Carabelli (1842), Paul Goddard (1844), M. S. Cartwright (1864), N. W. Kingsley (1829-1913), E. Magitot (1833-97) terminating with the divisions by Calvin S. Case and Edward H. Angle. The classifications of the last two named are, or should be, familiar to all.

It is not my intention to go into any detail regarding the history or the value of the different classifications of malocclusion of the teeth. That is the function of the historian and the critic. I merely mention this in passing, because as I am to discuss the etiology of a *Class,* it is essential to know exactly its significance. Judging by the terminology employed wherever orthodontia is known, it seems to be an undeniable fact that the classification worked out

by Angle is universally adopted. It is therefore of advantage to employ it as it is more familiar not only to me but also to the greater number in the profession.

As you are all aware, Angle's groups are known by Class I, II, and III. The distinguishing features of his classification are based upon the "mesiodistal relation of the teeth, dental arches and jaws, which depend primarily upon the position mesiodistally assumed by the first permanent molars on their erupting and locking." (Angle, "Malocclusion of the Teeth," p. 35.)

There has recently been an earnest effort made to substitute names for the numbers indicating the classes. Judging by its general adoption, it seems to have met with decided success. In this scheme, "Distoclusion," for example, is substituted for "Class II." The idea, I presume, was to employ an expressive term instead of the meaningless number. In significance, however, it is obvious that Class II and Distoclusion are synonymous.

It will be of considerable advantage to have a thorough understanding of the meaning of these new terms if a clear conception is to be gained from the interpretation of the evidence to be adduced. Angle's distinction of Class II from the other classes is based on the position of the "Lower arch" as being "distal to normal in its relation to the upper" (p. 57). Dewey defines "Distoclusion, or Class II cases of malocclusion" to be "those that are characterized by a distal (posterior) relation of the lower arch" p. 58). In explanation, it must be stated that mesial or distal, according to Black, refers toward or away from the median line or sagittal plane. The dental arch, as interpreted by Black, is a line bisected in the sagittal plane, corresponding to the proximal contact of the central incisors. This being the median line, the position of each tooth in the dental arch may be described in relation thereto. But the position of the mandibular dental arch or the mandible as a whole cannot be referred to in this manner. To say that the mandibular arch is distal to the maxillary is saying something that cannot prevail. On the other hand, to use the terms *distal* and *posterior* synonymously, as Dewey does, is confusing. Especially so when he employs these terms in defining *distoclusion*, which he describes as being characterized "by a distal relation of the lower arch." There is an old proverb: "When one is to go from one difficulty into another, it is wiser to stay in the first with which he is already familiar." I therefore prefer to employ the term Class II in this discussion. And if for other reasons any justification be necessary, I shall defer it until the evidence will be examined.

Before going any further, it will be of importance to have also an understanding on the significance of the two phases in which Class II appears; namely, division 1 and division 2. The fundamental characteristics are alike in both divisions, i.e., *distal occlusion*. The distinguishing differences given by the authorities in orthodontia are manifested in the position of the incisors and the width of the maxillary arch, etc. Thus, in division one the maxillary incisors protrude, in division two they retrude. In the former the maxillary arch is narrow, in the latter it is *not* narrow, etc., etc.

In my studies on the morphology of the dental arch, I was fortunate to

find a series of skulls at the American Museum of Natural History of New York, which presented interesting manifestations in this relation. This series consists of 28 Hindoo skulls. They all came from the same locality and present similar physical characters. Among them were 5 that presented malocclusal manifestations known as Class II, division 1. In the others the teeth were in normal occlusion. It was then thought that in such a closely related series definite evidence might be discovered that would corroborate the various hypotheses relating to the physical changes in the mandible, the condyle, the temporo-mandibular joint, etc., ascribed to Class II, division 1. Upon careful examination no distinguishing difference could be discovered in the glenoid fossa, in the condyle, in the neck of the condyle, or in the coronoid process between the mandibles of the normal dentitions and those presenting Class II malocclusion.

The measurements of the angle of the jaw, i.e., the angle formed by the body of the mandible and the ascending ramus, yielded some results. For example, it was found that the two angles of each mandible in all the skulls were not alike, there being differences of as much as 5° in some instances despite the fact that the teeth were in normal occlusion. However, on averaging the general result of the measurements of the skulls with normal occlusion and those with Class II, division 1, malocclusion, some differences were discovered. Thus:

COMPARISON OF THE ANGLES OF THE MANDIBLES OF SKULLS WITH DENTITIONS IN NORMAL OCCLUSION AND OF OTHERS WITH CLASS II DIVISION 1 MALOCCLUSION

RIGHT SIDE

	Number	*Average*	*Standard deviation*
Normal Occlusion	23	60.92°	±6.34°
Class II division 1.	5	66.8°	±5.15°
	(Difference of Average 5.88°)		

LEFT SIDE

	Number	*Average*	*Standard deviation*
Normal Occlusion	23	59.61°	±6.15°
Class II division 1.	5	64.60°	±4.82°
	(Difference of Average 4.99°)		

BOTH SIDES

	Number	*Average*	*Standard deviation*
Normal Occlusion	46	60.22°	±6.20°
Class II division 1.	10	65.60°	±5.23°
	(Difference of Average 5.39°)		

From this it may be seen that the Angles of the mandibles of those skulls presenting Class II, division 1, manifestations are more acute than those the dentitions of which are in normal occlusion. The extent to which the angles of the Class II mandibles vary from those of the normal series is on an average of 5°, approximately. In addition to this the standard deviation shows a closer uniformity in the degree of the angles in the Class II mandibles. The range of variability is greater in the angle of the normal than in that of the malocclusal mandibles. It may therefore be safe to say that the *morphological difference in the mandibles of the Hindoo skulls examined having their teeth in normal occlusion from those presenting Class II, division 1, malocclusion, is in the degree of the angle of the mandible.*

In the study of Class II, division 2, the task is more complicated. First, it is extremely difficult to locate a similar homogeneous series of skulls, and secondly, a like course of procedure would probably not yield similar results. The procedure, therefore, had to assume a different phase. Thus, it is quite familiar to all that the mandibles in *Class II, division 2,* cases are not receded to the extent, if at all, of those in Class II, division 1. This is clearly manifest in the facial expression of the patients themselves as indicated by the prominence of the chin, as well as in anatomic material. It was assumed that in the search of any physical differences in this form of malocclusion other characteristic distinctions may be found. In the full division nothing noteworthy could be discovered. It was then thought that if any particular character should be prevalent, it may be more easily discovered in the subdivision of this division. Three skulls with Class II, division 2, subdivision cases were at my disposal at the American Museum of Natural History. After a careful examination, it was noticed that while the lateral halves of the mandible and man-

Fig. 1.—Skull of European white, (Am. Mus. Nat. Hist.), occlusal view, showing mesial position of upper right molars. Observe their relation to the malar bone.

dibular dental arch did not differ, those of the maxillary did. That is, while the mandibles were symmetrical, the maxillae were not. Namely, the molars on the malocclusal side, it was noticed, were located more mesially than those on the normal side. As may be seen in Fig. 1, (occlusal view) the first maxillary molar on the right side is placed considerably more anteriorly to the malar bone than that on the left side. Moreover, on the right side the three molars are more comfortably accommodated and more evenly aligned than those on the left (the normal) side, where they are considerably crowded. Upon examining the jaws in apposition, (Figs. 2 and 3) it will be seen that the crowded left side is the normal one, while the evenly aligned right side is the abnormally occluded one. The same characteristics were evident in the other skulls. Another point of importance is the fact that on measuring the distance between the anterior margin of the foramen magnum and the central fossa of the maxillary first molar on either side, it is found that the dimension on the abnormal side is at least 3 mm. greater than that on the normal side.

Measurements of casts of 8 Class II, division 2, subdivision cases in practice yielded similar results. The measurements of the casts were made from the incisor point—the point on the gum papilla between the central incisors—to the occlusal extremity of the lingual groove of the first molar. There were no differences found in the dimension on both sides of the mandibular dental arch. The measurements of the maxillary dental arch revealed the fact that the molars on the malocclusal side were at least one millimeter nearer the incisor point than those on the normal side.

From this evidence, it appears that the abnormality of this description does not consist in a distal locking of the mandibular molars but rather a mesial locking of the maxillary molars. The subsequent interpretation of the probable causes of Class II will shed further light on this problem. Owing to this situation, it is preferable to designate these forms of malocclusion by the term Class II, because, this term places no restriction on the interpretation, while the other, (distoclusion) limits our conception to a definite phase which is not borne out by fact.

Fig. 2.—The same skull as in Fig. 1. Right side, showing malocclusal relationship in the molar region.

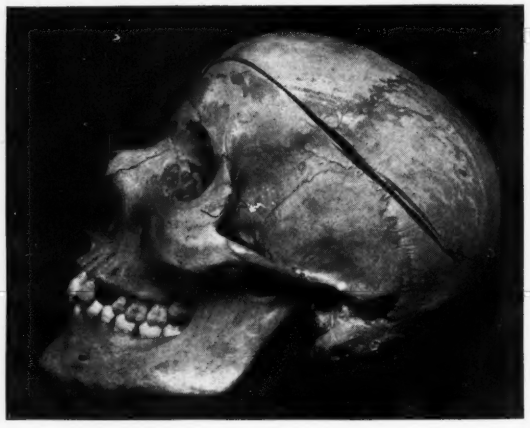

Fig. 3.—The same skull as in Fig. 1. Left side, showing normal relationship in molar region.

THE CAUSES OF MALOCCLUSION OF THE TEETH FROM AN HISTORICAL ASPECT

A zest of interest is added when our historic records are consulted for references pertaining to the causes of malocclusion in general. Such a vast variety of causes can be discovered therein as to satisfy the most fastidious tastes. Observations are recorded bearing on etiologic problems from the occurrence of irregular teeth as accompaniments to other manifestations, to the most fantastic and scientific conceptions. It is amazing to note how often a cause is discovered and rediscovered and what claim is laid now to originalities of observations that were made decades before.

Hippocrates (460-355 B.C.) for instance, noticed that "among those individuals whose heads are long-shaped, some have thick necks, strong members and bones; others have strongly arched palates, their teeth are disposed irregularly, crowding one another."

By the treatment recommended, it is evident that *Celsus* (50 A.D.) attrib-

utes the cause of irregularities in the permanent teeth to the retention of the deciduous series. For he says that "if a second tooth should happen to grow in children before the first has fallen out, that which is to shed is drawn out."

Paul Aeginetta, on the other hand, (625-690 A.D.) attributes the cause to the presence of supernumerary teeth. These two ideas prevailed until the beginning of the eighteenth century.

With *John Hunter* (1728-93) the physical aspect of the size of the teeth as the causes of malocclusion assumed considerable importance. Thus, he maintains that "that part of the jaw, which holds the ten fore teeth of the first series, is exactly of the same size when it contains those of the second, and as these last often occupy a much larger space than the first, in such cases the second set are obliged to stand irregularly."

Robert Woofendale (1783) on the other hand claims that it is the presence or absence of the deciduous teeth that controls the future of the permanent series. And, says he, "if proper attention were paid to removal of the first set of teeth, the just symmetry and proportion of the second might be preserved."

Robert Blake (1793), nevertheless, comes to the interesting biologic conclusion that irregularities are really established during the period of development of the permanent teeth in the jaws, despite the fact that the alveolar arches continue to increase during the entire progress of formation of the teeth. Habit as a cause of protrusion of the mandibular teeth is advanced by *John Fuller* in 1810. He claims that the habit "of projecting the under jaw forward" causes it to remain so permanently.

Delabarre in 1819 advanced the idea that general disturbances are a hindrance and retard or prevent "the development of the maxillary bones." Also *F. Maury* (1828) attributes want of development as being due to the condition of general health. He, nevertheless, contends that other prolific causes may be due to defective conformation of the jaw, excessive dimensions of the teeth in proportion to that of the jaw, accelerated development in the dentition of one jaw and retarded development in that of the other, too large size of the teeth in one jaw which does not harmonize with that of the teeth in the opposite jaw.

Contributions on the etiology of malocclusion by *Imrie* (1834, *Kneisel* (1836), *Harris* (1806-60), *Rodrigues* (1839), *De Loude* (1840), *Nasmyth* (1845), *Flagg* (1859), *McQuillen* (1863), *Kingsley* (1829-1913), *Sewill* (1870), *Hepburn* (1870), *Guilford* (1874), *Magitot* (1833-97) and others, added to the factors named a number of other possible causes. Thus, prominence was given to heredity, lack of development of the alveolar arch or of the jaw, too long retention of the deciduous teeth, prevalence of supernumerary teeth, influence of the artificial modes of living brought on by civilization, habits of finger-sucking, thumb-sucking or tongue-sucking. In addition to these *Harris* added disturbances in growth; *De Loude,* small jaws of one parent and large teeth of the other; *Desirabode,* single rootedness of the anterior teeth cause them to be more frequently irregular and organic malady of the alveolar arch is productive of irregularities; *Kingsley,* prolonged use of the artificial nipple, adenoids and mouth breathing; *Fleschmall,* rhachitis.

J. Lefoulon (1841) through his own studies, observation and investigation, crystallizes his findings in the following etiologic factors:

1. "Constitutional differences brought about by social, economic and geographic conditions.

2. "Prenatal conditions, producing disturbances in size of the deciduous teeth.

3. "Disease processes, like scrofula, that may affect the size of the permanent teeth.

4. "Sounds of speech in which the tongue strikes against the upper anterior teeth pushing them forward."

Bridgeman (1856) not affected by the significance of Lefoulon's ideas adheres to the mechanistic aspect in his three forms of force that cause malocclusion. Namely,

1. *Vis incrementi,* external muscular force, as that exerted by the lips and cheeks.

2. *Vis extensionis,* internal muscular force, as that exerted by the tongue.

3. *Vis occlusionis,* occlusal force.

Another set of factors was conceived by *Thomas Ballard* (1864) on which was based his theory of "Fruitless Sucking." Under this theory, he attributes the diverse forms of malocclusion to be due to erroneous practices to which infants are exposed. Namely, (*a*) being put to the breast before the milk is secreted; (*b*) being allowed to suck at a breast which does not yield as much milk as the infant requires; (*c*) being fed by bottle, fitted with a calf's teat, a piece of wash-leather, a parchment or a long used India rubber teat; or (*d*) being supplied with a sugar teat consisting of some moistened bread and sugar tied in a rag, and given to the child to suck in order to keep it quiet.

Talbot's contribution to the etiology consists in the following: He maintains that "Malnutrition resulting from disease, from insufficient or unsuitable food, and unhealthy environment, is the cause of idiocy, insanity, blindness and other defects. Derangement of the nervous system usually underlies these conditions as found among the poor. But, there is another class of individuals who suffer from neurotic conditions. They are those who are well fed and housed, but have overtaxed their nervous systems by improper modes of life and various forms of excitement. This want of balance produces an osseous system that shows excessive development in some of its parts and arrested development in others." "Nowhere," says he, "is this more manifest than in the maxillae."

With this array of factors advanced as contributing causes of malocclusion of the teeth, there is little that may be desired to gratify the most exacting demands for a suitable explanation of any particular cause of malocclusion.

PRACTICAL APPLICATION OF THE CAUSES OBSERVED

When practical application of all these causes is resorted to, discrepancies arise. This however is not surprising. Because, in addition to careful observations, considerable experience, sound judgment and well founded scientific methods must be employed. The discrimination between cause and

effect has always been a baffling problem, because the fundamental principles involved are not simple and therefore not readily understood. For example, the development of function is so closely associated with the development of form as to make it extremely difficult to decide which is the cause and which the effect. Great controversies raged on the question of the one being the result of the other and *vice versa*. For instance, "there can be no doubt," says Conklin, "that minute changes of function can frequently be detected where no corresponding change of structure can be seen." It cannot, however, be concluded that function preceded structure. Because, with the ultimate perfection of the microscope, there may be a probability of discovering a corresponding change in structure. The conservative view taken at present is that both function and structure are different aspects of one and the same thing, namely, *organization.*

The attribution of the variously observed causes as etiologic factors of malocclusion has so far been vague, loose and unconvincing. To attribute a certain manifestation to a certain cause does not mean anything unless it can be proved, first, that this cause will always produce such a result, and secondly, that no other cause will produce such a result.

Not many years ago, the late Dr. James G. Lane had the entire etiologic problem of malocclusion in a nutshell. It was all based on the disturbances of the tonsils and the adenoids. Thus, when the adenoids were affected, he claimed that Class II was the result. When the tonsils were diseased, the individual developed Class III. And when both the adenoids and the tonsils were diseased, Class I malocclusion developed. This seems rather an exaggeration of the significance of the adenoids and tonsils in the causative bearing on malocclusion of the teeth. And yet, it is shared by more modern orthodontists than one would be willing to give it credit for. Though it may not be carried to such extremes, it is nevertheless viewed with considerable earnestness.

I shall quote from one of the most exhaustive works on orthodontia, a work that has recently been published and presents orthodontia from its broadest and most modern aspect. I refer to the work by Dr. Martin Dewey, "Practical Orthodontia."

Referring to Class II, division 1, Dewey says: "Mouth breathing has disturbed the forces of occlusion, especially muscular pressure, which has resulted in allowing the maxillary anterior teeth to protrude in the upper arch and in permitting them to remain in an undeveloped condition buccolingually. The underdeveloped mandible and the receding chin are the result of the distal occlusion of the mandibular teeth and the abnormal action of the muscles" (pp. 58 and 149.) He adds that "mouth-breathing has long been recognized as a cause of malocclusion and is generally the result of adenoids." Here, then, adenoids are blamed for Class II, division 1.

"If mouth-breathing occurs early in life," says Dewey, "we find the deciduous teeth as shown in Figure 176 which makes distoclusion with labioversion of the maxillary anterior teeth, or Class II, division 1, the prevailing type. If mouth-breathing occurs after the locking of the first molars, and the cusps of the teeth are long, we find such cases as are shown in Figure 38

(Class I, resembling Class II, division 1) due to the protrusion of the upper anterior teeth." "In fact, long continued mouth-breathing," contends Dewey, "may be said to be responsible for all the conditions found in Class II, division 1." (p. 439.)

With reference to Class II, division 2, cases Dewey says (p. 467), "the majority of cases and patients seen by the author during his practice, gave a history of having been mouth-breathers at one time, but probably there are other factors that also cause this condition of malocclusion. By far the greater number have had operations for adenoids or have been troubled with nasal obstructions at some time. The author is of the opinion that these patients were at some time mouth-breathers and that the abnormal muscular and atmospheric pressure has permitted the mandibular molars and teeth to assume a position distal to normal. The teeth have protruded, the tongue has been in the lower part of the mouth, and the lips have acted abnormally; then, as a result of an operation or change in environment, normal breathing has become possible and the patient, conscious of the deformity, has closed the lips, with the result that the upper and lower lips have forced the maxillary anterior teeth back against the mandibular anterior teeth. With the tongue held in the upper part of the mouth, the upper arch has developed to nearly the proper width, which development was also stimulated by nasal breathing. As a result of these factors, Class II, division 2, differs from Class II, division 1, in every respect except in distal relation of the lower dental arch. The upper teeth are bunched and retruding, the upper arch nearly the normal width, the mandible nearly normal in development, and the chin normal or well developed. These last conditions have all been the result of normal muscular and normal atmospheric pressure." (p. 468.)

These statements are quoted not for the purpose of criticism or with the intention of condemning the views expressed. They are merely brought to your attention because they represent the concurrent opinion maintained by the profession.

OBSERVATIONS ON VARIOUS FACTORS ASSOCIATED WITH MALOCCLUSION OF THE TEETH IN GENERAL AND CLASS II IN PARTICULAR

It is a scientific fundamental requirement that all hypotheses should be verified and that verified hypotheses must be guaranteed by *proof*. Scientific proof again is a definite method which is sharply distinguishable from historical proof or proof in the popular sense.

"When a new discovery is made in science," says Knight Dunlap, Professor of experimental Psychology in the Johns Hopkins University, "the statement of the discoverer, that such and such a phenomenon has occurred, has in itself no scientific value. The discoverer must formulate the experimental conditions under which the phenomenon described may be observed by any one whose scientific training has been adequate."

It will be evident that these conditions are not fulfilled in the statements quoted. The privilege, therefore, of treating this problem in a scientific manner is granted to all. It will consequently be of considerable gratification to

bring before this meeting the results of observations made in connection with the problem of the cause of malocclusion in general and Class II cases in particular.

Seth K. Humphrey in "Mankind" calls attention to the fact, that "In his physical aspect, man, given anything like normal conditions, develops true to image predetermined by inheritance, down to the last item in his anatomy. It is a remarkable fact that physical inheritance yields very little to any environmental influence, short of malnutrition, accident and disease—and these three are abnormal conditions."

To approach the problem of etiology in a scientific manner, we must proceed from the fundamental aspect of these conditions; that is: nothing but malnutrition, accident and disease will affect the physical inheritance of man. If we consider malocclusion of the teeth as representing a modification of his physical inheritance then it must be due to one or all of these conditions. Of course, accident may be dispensed with as it is directly traceable and is a matter of chance or even carelessness rather than fate.

It is therefore of interest to know in what relationship nutrition and disease may stand to malocclusion of the teeth. Nutrition, for example, plays an important rôle in all phases of life. The development of the teeth and the jaws depends to a large extent on the nutritional processes at a very early period of life. Nursing is the normal process of feeding the human offspring. Any deprivation of the infant from this source of food will bring about untoward conditions of various sorts and at the same time have a harmful influence upon the individual as a whole as well as upon tooth formation and jaw development.

The examination of 354 children, both boys and girls, ranging in age from 3 to 15 years, revealed the fact that 71 or 19.94 per cent were breast-fed, 86 or 24.17 per cent were bottle-fed and 199 or 55.89 per cent were breast-fed for a short time (from a few days to about six weeks) and later had to resort to the bottle. Both the bottle-fed and breast-and-bottle-fed numbered 285 or approximately 80 per cent. Normal occlusion of the teeth among these children existed to the extent of 3 per cent while 97 per cent had various forms of malocclusion. From an inquiry into the general pathologic disturbances that 310 of these children were afflicted with, the list shown in Table I was constructed.

As will be evident from Table I, the diseases occurring in more than 20 per cent of the cases examined are measles, chicken pox, whooping cough, affections of the adenoids, affections of the tonsils and sucking habits. The rest of the diseases as may be seen appear in such small numbers as to warrant no special mention. If disease processes be assumed to have a certain bearing on malocclusion of the teeth, it would be reasonable to name those that appear most frequently in their association. These would be, measles, 60 per cent, chicken pox, 41.61 per cent, whooping cough, 50.32 per cent, adenoids, 61.61 per cent, tonsils, 52.9 per cent, and sucking habits, 29.03 per cent. The habit of sucking, though not belonging to disease processes, was included in the list merely for the sake of convenience.

On arranging the distribution of the most frequently appearing disturb-

TABLE I

DISTRIBUTION OF DISEASES IN 310 CHILDREN EXAMINED

DISEASES	NUMBER PERCENTAGE
Measles	186 or 60.00%
Chicken pox	129 " 41.61%
Scarlet fever	33 " 10.65%
Eczema	14 " 4.52%
Bronchitis	9 " 2.90%
Whooping cough	156 " 50.32%
Asthma	2 " .65%
Diphtheria	11 " 3.55%
Pneumonia	22 " 7.09%
Affection of the Adenoids	191 " 61.61%
Affection of the Tonsils	164 " 52.90%
Mastoiditis	5 " 1.61%
Adenitis	19 " 6.13%
Intestinal Disturbances	37 " 11.93%
Appendicitis	8 " 2.58%
Convulsions	3 " .97%
Nervousness	27 " 8.71%
Anemia	4 " 1.29%
Rickets	7 " 2.26%
Rheumatism	6 " 1.93%
Mumps	40 " 12.90%
Finger, tongue or lip sucking habit*	90 " 29.03%

*This habit though not a disease is included in the list merely for the sake of convenience.

ances, in accordance with the different classes of malocclusion, in Table II, it is found that there is no indication of any particular grouping. For example, mouth-breathing and its cause, adenoid vegetation, which is generally blamed for Class II manifestations is equally divided between Class II and the other classes. The only instance in which there seems to be a positive correlation

TABLE II

DISTRIBUTION OF DISEASES EXPRESSED IN PERCENTAGE

DISEASES	NUMBER	CL.II DIV. 1	CL.II DIV. 2	OTHER CASES
Measles	186	34.94	13.97	51.07
Chicken pox	129	40.31	11.62	48.06
Scarlet fever	33	30.30	9.09	60.6
Eczema	14	28.57	14.28	57.13
Bronchitis	9	22.22	11.11	66.66
Whooping cough	156	36.54	13.97	51.07
Asthma	2	0	50.0	50.0
Diphtheria	11	54.54	0	45.45
Pneumonia	22	36.36	4.54	59.99
Affection of the Adenoids	191	37.74	13.08	49.21
Affection of the Tonsils	164	34.14	14.02	51.82
Mastoiditis	5	40.	40.	20.
Adenitis	19	47.36	15.79	36.84
Intestinal disturbances	37	27.02	10.81	62.16
Appendicitis	8	37.5	0	62.5
Convulsions	3	0	0	100.
Nervousness	27	37.37	22.22	40.74
Anemia	4	50.	50.	0
Rickets	7	0	0	100.
Rheumatism	6	50.	0	50.
Mumps	40	40.	10.	50.
Finger- tongue- or lip-sucking habit*	90	60.	2.22	37.77

*This habit, though not a disease, is included in the list merely for the sake of convenience.

is sucking habits and Class II, division 1. In this particular 60 per cent of those possessing this habit present Class II, division 1, cases.

TABLE III

COMBINATION OF DIVERSE FACTORS IN PERCENTAGE

	NUMBER	CL.II DIV. 1	CL.II DIV. 2	OTHER CLASSES
Adenoids and Tonsils	167	35.32	14.97	49.70
Breast, Adenoid and Tonsils	30	40.	13.33	46.66
Bottle, Adenoids and Tonsils	9	77.77	0	22.22
Breast, Ade., Tonsils and Sucking	134	35.82	13.43	50.74
Bottle, Ade., Tons., and Sucking	40	60.	5.	35.
Bottle and Sucking	72	58.33	2.77	38.88
Breast and Sucking	13	84.61	0	15.38
Bottle, Whooping, Sucking	32	59.37	6.25	34.37
Breast, Whooping, Sucking	10	60.	0	40.
Measles, Chicken Pox	105	36.19	12.38	51.42

If we now combine the most frequently appearing disease processes with the breast-fed and the bottle-fed, and note their relationship to the different classes of malocclusion, very curious results are obtained (see Table III). *First,* it is found that tonsil and adenoid disturbances occurring simultaneously have no closer correlation to Class II than to the other classes. *Second,* when breast-feeding or bottle-feeding with adenoid and tonsil disturbances are grouped together, they present an approximately equal distribution between Class II and the other classes. *Third,* when the sucking habit is included in any of the groups shown in Table IV, the percentage is considerably higher in Class II cases. And lastly, most curious of all is the fact that the combination of breast-feeding and sucking shows the highest percentage in Class II, division 1.

It may, therefore, be quite safe in saying that the habit of sucking is the only factor that stands in intimate and positive relationship with Class II cases and especially with those in division one. In this connection, it may also be stated that by far the greatest number were finger or thumb suckers (72). The next large group constituted the "pacifier" suckers (23). And the others sucked the tongue (3), the lip (2), the blanket (1), and a handkerchief (1).

An effort was made to discover the time of the beginning of the habit of finger-sucking, i.e., when it was first observed. In every instance the parent could not remember when the baby did *not* suck his finger. In a number of observations I noticed that babies sucked their fingers immediately upon delivery. Whether this habit is acquired during labor or immediately after birth or whether it is practiced before birth is difficult to ascertain. In view of the fact that the hands and fingers are in close proximity of the mouth *in utero;* and in view of the fact that the hands are employed in depressing the jaw during the formation of the hard palate, as is contended by Michio Inouye, it seems not improbable that this habit may be an acquisition that antedates birth. If future investigation shall prove this to be true, it will be quite evident why there is a relationship of this habit and Class II, division 1, and why the angle of the mandible is so modified as to correspond to the description given above.

5. AN INTERPRETATION OF MALOCCLUSAL MANIFESTATIONS ON THE BASIS OF THE PHENOMENA OF GROWTH

In lieu of more extensive embryologic evidence bearing on this phenomenon, it is of importance to have a general conception of the intricacies involved in the problem at hand. Malocclusion of the teeth is essentially an expression of some discrepancy in growth. Growth, as generally understood, is a process of gradual accretion of body substance until the adult size is reached. But when the adult size is reached, it is observed that not all the individuals are of equal proportions. Some are small, some are tall, some are frail, some are stocky. These differences, it is found, may be associated with differences in races, with differences in sexes of the same race, with differences in groups of the same race and sex under different social or economic conditions, with differences in individuals of the same race, sex and group, and also with differences in parts of the same individual. Thus, long bodies and short limbs are no uncommon occurrence as are long limbs with short bodies. Large heads associated with small individuals are as frequent as small heads with tall individuals, etc., etc.

The popular attitude is to assume that growth begins after birth. It must therefore be explained that growth occurs as a constant manifestation from the fertilization of the egg to the completion of the adult individual. But it does not proceed with the same speed. There are periods when growth is accelerated and others when it is retarded. These accelerations and retardations bring about differences in the proportions of all that is growing. For example, as measured by weight and height, the growth of the entire body takes place at a very rapid rate up to the fifth month of fetal life. After that, the body keeps on growing but the rate at which growth takes place is much slower until about four years before puberty. At this period, the rate is once more accelerated to be retarded again after sexual maturity. As sexual maturity occurs earlier in girls than in boys the former will accelerate at an earlier period and really be taller than the latter at a certain age.

These accelerations and retardations bring about certain results. That is, they create differences. For instance, accelerated individuals will grow taller at an earlier age. Retarded individuals, on the other hand, will be smaller during the period of retardation and in some instances make up their loss during the period of acceleration. But if the period of acceleration itself is retarded, i.e. delayed, in retarded individuals, they are confronted with a great difficulty. Namely, they have to make up at a later period and in a shorter time all they have missed. Growth then may occur at a tremendous rate and at an enormous expenditure of energy. But owing to the shortness of the period involved, it is questionable whether it is at all possible to make up during a short acceleration period of growth the loss that an extended period of retardation caused. In fact, Professor Boas has found that when children are retarded in height up to the twelfth year they remain permanently short in stature.

These general considerations are applicable to all phenomena of growth. Whether it is the growth of the body as a whole or of the various constituent

parts of the body, they are all subject to these general and inexorable laws. Moreover, it must be remembered that these phenomena are normal and physiologic manifestations. When, however, pathologic conditions intervene, these processes are considerably accentuated. And instead of producing variations in type, they bring about abnormalities. Thus, for instance, retardations in size complicated by thyroid disturbances bring about not only diminished stature but also mental deficiency. On the other hand, acceleration in growth when complicated by hyperpituitarism, brings about not only gigantism, but also inhibition of sexual desires. Thus, pathologic conditions simply accentuate or exaggerate such physiological manifestations as are observed in *retardation* and *acceleration*. For example, if cleft palate be considered from this aspect, it will be evident that it is a manifestation not only in the failure of union of the palate processes alone, but rather owing to the extended retardation in growth of these processes, the stage of union is not reached. That there is an abnormal retardation in such cases, probably due to pathologic conditions, is evident. Because, in most of such cases, there is not only a lack of union and growth of the palate processes alone, but there are usually also deformed teeth and completely missing dental germs as well as a consequent lack of growth of the upper alveolar process and possibly also the body of the upper jaw bone.

Excessive retardations in the eruption of teeth are often the cause of permanent impactions. This becomes evident upon reflection on the prevalent frequency of impacted third molars. These teeth erupt at a late period in the growth of the individual. Retardation of the processes of growth in general at that period is excessive. The normal eruption of the third molars occurring so late is usually accompanied by difficulties. Pathologic conditions, due to the difficulties involved, complicate this process. As a result, the period of eruption *per se* becomes excessively stretched, and invariably prevents these molars from assuming a normal position even when completely erupted. In the greatest number of cases as you are all aware, they remain imperfectly erupted or entirely impacted.

On the other hand, accelerations in the eruption of teeth produce difficulty of another sort. Thus, for instance, the early eruption of the mandibular permanent canine teeth, which is a frequent occurrence, brings about modifications in occlusion, because the necessary space for them is not normally allotted before the shedding of the mandibular deciduous first molars. Again, the acceleration in the shedding of a deciduous tooth and the retardation of its permanent successor find expression in the many forms of malposition of the teeth with which you are well familiar.

Just as the palate processes in cleft palate may fail to unite because of lack of growth and just as the teeth may remain permanently impacted because of extensive retardation in eruption, so there may be various shades of retardations in growth at the time the head develops. During the embryonic period of the head formation, growth occurs at its highest rate. Things happen very swiftly. If retardations occur, they need not necessarily last long to cause growth of certain parts to fall behind the rapidly forming

organs. An excessive retardation in the frontonasal process and the future nose and premaxillary bones will never be able to make up their loss. An acceleration in growth in one or both of the lateral processes and a condition as may be associated with Class II, division 2, is not unimaginable. An acceleration or retardation in the growth of the mandible and Class II, division 1, or Class III may be the result. To what extent these retardations and accelerations may influence morphogenesis when hereditary or pathologic factors are involved is as yet difficult to make even a reasonable guess. It is, however, difficult to refrain from these assumptions because the trend of modern experimental investigation is definitely heading in that direction. It therefore will depend on the investigations in the very near future to corroborate and perhaps verify these assumptions. Meanwhile, it is worth while to keep them in mind.*

Another aspect to be assumed in the interpretation of the causes that modify growth and accentuate the retardation and acceleration phenomena is that concerning the influence of nutrition and diseases after birth. As shown recently by McCollum, it is possible to produce experimentally tall rats and small rats; well rats and sick rats; rats with keen eyesight and rats with impaired eyesight; and many other things of a like nature. And all this can be done by means of nutrition. The sad experiences of the late war show results of a similar character in the offspring of man, mainly due to shortage of certain foods.

Even if we choose groups of children belonging to different economic strata of the same race and nation, the effects of food and other care will be manifest. Tables IV and V show the effect of the differences in economic conditions on stature and weight in two groups of girls. Note the difference in both height and weight, the wealthy group exceeding the poor by an average of five inches in height and 12 pounds in weight. It is of considerable significance to note that the retarded group (the poor) did not make up in stature despite the fact that in weight they regained their loss during the period of acceleration.

Another aspect must be brought into consideration at this point. "Up to the present day," says Lowie, "the determination of causes, *rerum cognoscere causas,* has been commonly assumed as the ultimate aim of scientific investigation. But in recent times advanced thinkers among philosophers of science have found the concept of causality lacking in definiteness and are supplanting it with the mathematical concept of function. From their point of view, the entire universe appears as an assemblage of elements more or less closely dependent on one another, and the object of science is to ascertain the *functional* relationships of these elements."

"What precisely, are you to understand by the term 'function'?" *The quantity "y" is a function of the quantity "x," if "x" and "y" are so related that to every value which "x" may assume there correspond one or more values of "y."*

*When I wrote this I had no idea what Dr. Johnson was going to say at this meeting. My intention was to express the general fundamental ideas involved in this process. The embryonic stages shown by Dr. Johnson fully illustrate these truths.

TABLE IV
STATURE* OF GIRLS

AGE IN YEARS	NO. OF CASES	POOR AVERAGE	STANDARD DEVIATION	NO. OF CASES	WEALTHY AVERAGE	STANDARD DEVIATION
5	17	40.80	±3.96			±1.38
6	33	43.16	±3.63	7	46.72	±1.38
7	40	44.92	±4.61	17	49.05	±2.28
8	45	47.11	±5.41	32	51.03	±2.26
9	55	50.20	±5.21	56	52.28	±2.05
10	49	50.88	±2.56	28	55.46	±2.29
11	51	52.74	±3.12	34	56.05	±2.90
12	43	54.87	±3.49	27	59.28	±3.28
13	40	56.70	±3.03	23	61.48	±2.21
14	33	58.27	±3.16	23	62.48	±3.00
15	12	58.84	±3.05	8	62.87	±2.20

*In inches.

TABLE V
WEIGHT* OF GIRLS

AGE IN YEARS	NUMBER OF CASES	POOR AVERAGE	STANDARD DEVIATION	NUMBER OF CASES	WEALTHY AVERAGE	STANDARD DEVIATION
6	33	42.69	± 5.48	9	51.56	± 8.95
7	40	45.62	± 5.07	18	54.28	± 8.85
8	46	50.76	± 6.80	31	60.96	±10.14
9	54	60.37	± 8.67	56	64.52	± 9.29
10	49	63.18	± 9.00	28	75.05	±13.45
11	51	69.98	± 9.67	34	81.00	±15.68
12	43	81.47	±12.42	27	88.14	±12.56
13	39	88.34	±13.26	23	101.30	±14.49
14	32	101.31	±16.92	23	111.00	±24.57
15	12	105.08	±10.95	8	106.63	±12.88

*In pounds.

Thus, the cost of a loaf of bread is a function of its weight because the greater the weight the greater, everything else being equal, is the cost. The ascent to the top of a modern "sky-scraper" is a function of time because the greater the height, the longer, other things being equal, it will take to get there. The efficiency of the masticatory apparatus is a function of occlusion because the nearer the normal the occlusion, other things being equal, the more perfect is the function of mastication. Similarly, the resistance to diseases may be said to be a function of proper nutrition because the more proper the nutrition, other things being equal, the greater the resistance to disease processes.

Tallness, claims McCollum, has nothing in common with well-being. By proper food, tall animals can be reared. But these may not be *well* animals. Thus also on examination of the tall children with reference to other conditions, differences are found that are of considerable significance. For example, some of these children were bottle-fed in infancy, while others were breast-fed. If a comparison be made of these children as to the ability to resist disease, interesting data are obtained. Thus recording the number of diseases of each individual before appearing for examination, the following figures were obtained.

	NUMBER OF CASES	AVERAGE OF NO. OF DISEASES	STANDARD DEVIATION
Bottle-fed	86	5.59	±2.22
Breast-fed	70	4.04	±1.83

It must be explained that differences between two compared series may be *real* or they may depend on *accident*. We must remember that any group we may weigh or measure is, theoretically at least, composed of an infinite number of constituents. The number under our observation, on the contrary, is limited. An error of the average of a limited series may therefore arise, but it can be measured. The error of the average, as compared with that of an ideal, is measured by the ratio of the deviation to the square root of the number of cases, thus, $\frac{\delta}{\sqrt{n}}$

Therefore,

The error of the first average is $\frac{2.22}{\sqrt{86}} = \frac{2.22}{9.27} = .23$ and

The error of the second average is $\frac{1.83}{\sqrt{70}} = \frac{1.83}{8.36} = .21$

The error of the difference is $\sqrt{.23^2 + .21^2} = .3$

The difference of the average is 1.55, about five times as great as the error. A difference to be real must be at least four times as great as the error. It is, therefore, quite safe in saying that there is a real difference in the incidence of diseases between the breast-fed and the bottle-fed.

A comparison of the breast-fed and the breast-and-bottle-fed yielded similar results. Thus,

COMPARISON OF BREAST-FED AND BREAST-AND-BOTTLE-FED

	NUMBER	AVERAGE OF DISEASES	STANDARD DEVIATION
Breast-and-bottle-fed.	195	5.06	±1.81
Bottle-fed.	70	4.04	±1.83

The error of the first average is $\frac{1.81}{\sqrt{195}} = \frac{1.81}{13.96} = .13$

The error of the second average is $\frac{1.83}{\sqrt{70}} = \frac{1.81}{8.36} = .21$

The error of the difference is $\sqrt{.13^2 + 21^2} = .24$

The difference of the average is 1.02 more than four times as great as the error, therefore a real difference.

It was then assumed that there might be a possible correlation between a certain form of malocclusion and a higher incidence of diseases. Calculations brought forth the following results.

COMPARISONS OF OCCLUSION AND INCIDENCE OF DISEASES

	NUMBER	AVERAGE OF DISEASES	STANDARD DEVIATION
Normal Occlusion	10	4.4	±1.50
Class I	150	4.62	±2.19
Class II div. 1	102	5.39	±2.15
Class II div. 2	40	4.63	±2.20
Class III	11	6.1	± .94

As may be observed, there are differences in the averages obtained. Upon calculation by the above method, it was found that they are not real but only accidental. It may therefore be safely stated that, while bottle feeding is correlated with a higher incidence of diseases, due probably to inadequate food properties in cow's milk, and while it may thus give rise to a higher occurrence of malocclusion this incidence shows no correlation with any *particular* form of malocclusion.

SUMMARY

In summing up what has been brought forth in this contribution, the following points will become manifestly evident:

(1) That irregularity of the teeth or of any other organ is a biologic phenomenon and may occur in all living things.

(2) That malocclusions due to irregularities of the teeth, like the disturbed functions due to irregularities of other parts of animals and plants, are biologic phenomena.

(3) That attempts at classifying the irregularities and malocclusion of the teeth have been made as early as 1803.

(4) That these attempts terminated in the simple classification worked out by Angle which is accepted throughout the world.

(5) That the basis of Angle's classification does not prove satisfactory with respect to the divisions of Class II manifestations.

(6) That in skulls presenting Class II, division 1, the mandible is found to present a more acute angle than those belonging to skulls with normal occlusion. The body of the mandible therefore assumes a more posterior position in relation to the maxilla than in the normal skulls. The teeth of the mandible are therefore in distal occlusion.

(7) That in skulls presenting Class II, division 2, manifestations, there appears a reversal of this condition, i.e., the maxillary alveolar process appears to have drifted anteriorly; the teeth therein contained are consequently in mesial relation to those of the mandible.

(8) That various factors of malocclusion accepted by the modern orthodontist date back many centuries. Most of them have come down to us by tradition, and accepted on no other grounds but by the recommendations of some authority.

(9) That when put to test not one of the recommended factors is found to bear any definite relationship to a particular form of malocclusion.

(10) That the only factor found in close and positive relation to Class II, division 1, is the habit of sucking.

(11) That malocclusion is essentially an expression of some discrepancy in growth.

(12) That growth, though occurring as a constant manifestation from the fertilization of the egg to the adult size of the individual, is modified by retardations and accelerations.

(13) That accelerations and retardations when influenced by pathologic conditions result in deformities.

(14) That the development of the jaws and teeth are similarly subject to these retardations and accelerations.

(15) That 80 per cent of the individuals examined were bottle-fed.

(16) That the bottle-fed individuals present a higher incidence of diseases due to the artificial nature of the food.

(17) That of the individuals examined with reference to diseases 97 per cent had malocclusion of the teeth.

(18) That there is no correlation found between disease processes and any definite form of occlusion.

(19) That accelerations and retardation in growth influenced by pathologic conditions may explain the modified mandible in Class II, division 1, and the overdeveloped lateral portion of the upper alveolar arch and the concomitant underdeveloped premaxillary bone in Class II, division 2..

It may, therefore, be safely concluded,

(1) That mouth-breathing is not specially concerned in the production of Class II any more than it has influence to produce Class I.

(2) That the sucking habit has a *positive* though not exclusive relationship to Class II, division 1.

(3) That artificial feeding stands in direct relation to a higher susceptibility to pathologic conditions.

(4) That pathologic conditions have an exaggerating or activating influence upon retardation and acceleration in association with growth.

(5) And that retardations and accelerations associated with growth, influence the formation and completion of the masticatory apparatus as they do everything else that depends upon growth and development for its perfection. And, therefore, they also have an influence in the retarded development and diminutive size of the mandible with distal occlusion in Class II, division 1, and the forward drifting of the maxillary lateral halves with mesial occlusion of the maxillary teeth in Class II, division 2.

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DISCUSSION

The President.—You have heard this splendid paper of Dr. Hellman, which is really too long to discuss, but it shows a great deal of study and will become of great value to us when it is published. However, there are some men here who probably would like to discuss it, and I will throw it open for discussion for a short time.

Dr. Oscar Carrabine, New York City.—Dr. Hellman's paper is too scientific for the ordinary man to discuss. I shall not try to discuss it, but, I have an idea in reference to the cause of Class II cases that I should value Dr. Hellman's opinion.

I believe that we will all agree that Class II cases have been on the increase in the last twenty years, is it possible that the installation of steam heat in our homes is the great irritant that causes the inflammation of the adenoid tissue?

Dr. George F. Burke, Detroit, Michigan.—The essayist states that thumb-sucking is one of the causes of Class II cases. A great many of us know from experience and as a result of inquiry among mothers, that nurses, when babies are born, in order to keep them quiet, slip the thumb in the mouth. In a number of cases this bad habit is continued by the mothers after the nurses leave.

Not long ago a committee from the National Dental Association drew up a set of resolutions calling attention of the hospital authorities throughout the United States to the need of employing competent dental service in hospitals, which no doubt will have far-reaching effect. Why is it not possible for some good to come as a result of this paper, whereby a committee representing this Society would be instructed to draw up a set of resolutions dealing with the evil effects of thumb-sucking and have same published in the various nurses' publications, thereby educating them relative to the harm done to both the teeth and facial expression through such practices. The Hold-In-Hand-Mits have been found in my practice to be the most effective in breaking up this habit in early childhood. They are also helpful in nail-biting.

Dr. B. E. Lischer, St. Louis.—I would have given a great deal for a copy of this paper before coming to this meeting, because I cannot discuss it extemporaneously in a manner such as this valuable contribution merits.

I am afraid Dr. Hellman does not understand the terminology he has tried to knock down today, and I think it will not be many years before he will say so. He left the impression with me (now I may be wrong) that the terminology officially adopted by this Society was merely terminology. I think I had something to do with that terminology when it was first proposed, and I can truthfully say that your committee was not merely trying to put over a few new terms. We were really striving to free the orthodontic mind from certain narrow ideas; to us it meant the formulation of a proper conception of the pathology of oral deformities. It is undeniably true that the mastery of word-forms promotes the acquisition of ideas. Unfortunately, "the forms of expression first chosen are not always adequate to keep pace with the progress of science. Hence they must be radically changed and formed anew to meet the new demands." This is a problem with which every science has to deal.

Dr. Hellman showed a slide of a skull which he said presented a "Class II, Division 2, subdivision case". He took measurements from a point on the anterior border of its foramen magnum to a given point on each first permanent molar, and on one side found the molar mesial to the extent of three millimeters. He does not tell us which side was normal, yet he calls it a Class II case. Hence I ask, might not such a case be one of *mesioversion* of the molars and premolars on the side where they were three millimeters anterior to those of the other side?

In my paper yesterday I spoke of the inadequacy of an *exclusive occlusal interpretation,* and last night a number of my friends here (many of whom are older than I am and whose judgment I respect) said that I was right. Please note, too, that while Dr. Hellman clings to his "meaningless numerals" in the introduction, he uses the word *distoclusion* quite freely throughout the paper.

He also spoke of causative factors, and left the impression with me (again I may be wrong) that certain biological factors always operate in a certain way. I doubt the accuracy of such a statement. For example let us take scarlet fever. In one child it causes an otitis media; in another it results in nephritis; in a third child the end result may be a cardiopathy of some kind.

Dr. A. LeRoy Johnson, Boston, Mass.—There seems to be a confusion of ideas as to the meaning of cause and factor. Cause in a literal sense means that which produces a result without which it would not exist. It is also the sole determining effect of a condition.

On the other hand a factor is one of a number of elements which combined together produce a result. It seems to me that the evidence which Dr. Hellman has presented illustrates this difference very clearly. The forces which determine the development of any part of a living organism are so complex that we must, rationally, when referring to etiology, speak in terms of contributing factors, not of cause, in the definite literal sense.

Dr. Milo Hellman, New York City (closing).—Mr. President, it seems to me that all the questions raised in the discussion are adequately answered in the paper itself. The fact that my paper impressed Dr. Lischer in a certain way does not change its true meaning. We can all read a certain book and yet each one of us will be differently impressed by it. This however does not make any difference to the true meaning of the book. Dr. Lischer credits me to maintain that "certain biologic factors always operate in a certain way." I am quite sure that he will change his mind after he will have read the paper. I showed that the various diseases were equally distributed amongst all classes of malocclusion, so that you cannot trace any one to a particular class. Habit is one manifestation that has a positive relationship to Class II, division 1. It is, however, not an exclusive relationship. Regarding the terminology I can do nothing better than direct Dr. Lischer's attention to the explanations offered in the context of this paper.

As regards the effect of steam heat on the atmosphere and that on adenoid tissue which in turn causes Class II, it would seem that we are going back to Lane's etiology. Lane's etiology looks exaggerated, and yet it is maintained by most of you. In answer to Dr. Carrabine's query, I will say that a dry atmosphere has as yet not been proved to be the *only* etiologic factor of inflamed mucous membranes. *Infection* has something to do with it. And even if it were so, it certainly does not show to have any particular bearing on Class II, any more than it has on Class I, Class III, or normal occlusion.

Another thing as explained in this paper, is that Class II is also found in horses. Whether they lived under the same atmospheric conditions as we do I do not know.

The point that I wished to impress is, that in the study of etiology we have to begin from the bottom. We must first learn to grasp the biologic principles involved in life as a whole. If we want to build anything at all, we must place our structure on a firm foundation. Anything pertaining to life must be based on general biologic principles, and treated in a scientific way. Unless you do that, there is no hope of realizing our ambition in the solution of the baffling problem of the etiology of malocclusion of the teeth.

REPORT OF THE EDUCATIONAL COMMITTEE.—OUTLINE OF MATERIAL FOR UNDERGRADUATE INSTRUCTION IN ORTHODONTIA IN DENTAL SCHOOLS

By A. LeRoy Johnson, D.M.D., Boston, Mass.

THE science of orthodontia treats of the growth, development and functional activities of the dental apparatus, and so constitutes an essential element in the undergraduate curriculum of the dental schools.

The study of growth and developmental processes brings together in one concept the different branches of science as anatomy, histology, embryology, physiology, which the student has covered during the first two years of college work and emphasizes the practical significance of the knowledge of each. For example, from anatomy one learns of the external form of the mandible; of the ligamentous and muscle attachments it affords; of the teeth it supports and of the internal architecture of its structure. From physiology, as ordinarily presented, one learns of the mechanics of chemistry of the parts. But in the study of the growth and developmental processes with which orthodontia is primarily concerned one studies the interactions and relations of the different structural elements which make up the dental apparatus; the phenomena expressed in its organization. In bringing together the material of the different sciences and studying the accumulated evidence as a whole one sees the constant change and activity characteristic of living processes in their normal and abnormal aspects. (Such correlation of the material of science is the essence of orthodontia and is basic in dental education.)

JUNIOR LECTURES

The aim of the Junior lectures is to present the laws and principles of science which form the foundation for the interpretation of variations and developmental abnormalities of the dental apparatus. Lectures are also given upon technic laboratory course.

(One has to obtain a knowledge of the fundamental principles of science in order to realize the importance of such knowledge in the everyday practice of orthodontia.)

Historical Survey of Dentistry.

In the earliest records dentistry was considered a part of medicine. Later it drifted away from medicine and became an art of mechanics applied to the restoration of mutilated and missing teeth. This period contributed much to prosthesis, an indispensable branch of modern dentistry. Yet little progress was made in the development of dental science until dentistry was again considered a part of medicine; in other words until

pure mechanics gave way to biologic evidence and the teeth were recognized and treated as independent parts of the living organism as a whole. The science of orthodontia began with the recognition of the relation of the individual teeth to the growth, development and functional activities of the whole dental apparatus. Roughly speaking this was during the latter part of the nineteenth century.

(A review of the evolution of dentistry helps to make clear its present status and indicates in a degree at least the conditions and probable tendencies of future growth. It also lays the foundation for the definition of the field of orthodontia.

The basic knowledge of dentistry is not so much the cultivation of the art of surgery and mechanical dexterity, which is important and can be acquired by properly qualified students, as it is in acquiring an understanding of the biologic principles which concern the growth, development, function, nutrition, regeneration, and the application of these principles to dental problems.)

Definition of terms and phrases to show the unity of the different phases of biology in the study of form development.

Science. Natural Law. Morphology. Physiology. Psychology. Qualitative and Quantitative Analysis. Growth. Development.

A knowledge of the nature of science in general is a prerequisite to an understanding of any one of its branches. In organic science the basic principle is referred to as natural law. Law means the uniformity of the occurrence of a condition; a consistent recurrence of a condition; a "uniformity seen in the diversity of organic forms."

Morphology and physiology, while being distinct branches of science, must be treated as different aspects of the same thing in order to build a concept of the nature of living structure. Differentiate growth and development.

(A description of the means and methods of obtaining scientific data and of the way it is organized in science with reference to general truths or the operation of general laws is perhaps elementary for the professional schools but unless such knowledge is common to the undergraduate the foundation is always lacking upon which to build the scientific point of view.

The student should be trained to determine the value of evidence as it is presented in the literature. For example, he should see clearly that the results of one or two observations do not establish a general rule, and that all biologic phenomena relative to the dental apparatus cannot be explained by mechanical principles.)

Orthodontia Defined.

The field of knowledge which makes up the science of orthodontia is that relative to the functional activity of the dental arch as a whole, and with the laws which underlie its growth and development; it is that which refers to the functional interaction of the teeth, their supporting and sur-

rounding structures and the organism as a whole. More briefly it might be referred to as the science which treats of the forces controlling the form of the dental arch. The art is described as that part of dentistry concerned with the treatment of abnormalities of form which interfere with the normal functional activity of the dental apparatus.

(The purpose of modern dentistry is to assist in establishing and maintaining the normal functional activity of the masticatory apparatus of the human organism. Orthodontia is that part of dentistry concerned with deformities which interfere with the normal functional activity of the denture. Dental orthopedia would be better terminology for this branch of dental science as it more truly identifies the nature of the work. In strict sense the orthodontic problem requires that we think in terms of dental orthopedia and realize that we are treating the deformities that interfere with normal function and are not merely aligning irregular teeth.)

Occlusion of the Teeth.

Exposition of the Law of Occlusion.

The basic principle of dentistry, not alone of orthodontia.

The assumption of a form of occlusion peculiar to each species of vertebrates is based upon the following evidence: *First,* the Law of Occlusion; *Second,* the design and plan manifest in tooth-forms; *Third,* the correlation between the type of occlusion, the form of the teeth and the general structural plan of the organism as a whole. As the forms of the teeth and the general plan of structure of the surrounding parts vary in the different groups of animals, in like degree do the occlusal relations vary.

(Review Comparative Dental Anatomy as it impresses the mind of the student of dentistry with the distinctive character, form and relations of the teeth of the different groups of animals. Such study as this gives to the human teeth as regards their forms and relations a significance otherwise unappreciated. Each surface of a tooth in the light of such knowledge has a definite functional value which it is the mission of the dentist to preserve.)

Hypothetical Scheme of Occlusion.

Define hypothesis in its relation to scientific investigation.

The Ideal Scheme of Occlusion.

Being the theoretical relations of the occlusal inclined planes of the cusps of the teeth and tooth surfaces.

(The theoretical relations of tooth surfaces as laid down in the ideal scheme of occlusion is one of the great contributions to dental science. This ideal scheme gives to the dental student a basis for the study of occlusion from which to derive knowledge that is essential in all restorative work. Moreover, it develops the idea that the tooth surfaces, cusps and ridges are the functional units of the dental apparatus.)

Typical Occlusion.

Anthropology a basis for the study of Individuals.

Type defined as it expresses the extent and direction of individual variations. It defines certain limits of group variation. It is a step in the study of the individual.

(The misinterpretation of this word has been responsible for much superficial work in orthodontia. An exposition of the meaning of type in its literal sense should be given to the undergraduate dental student because it is basic in the concept of the normal. In prosthodontia where artificial representations of type are made practical use of, an idea or type may be falsely created that will seriously handicap an intelligent appreciation of the orthodontic problem.)

The Problem of Orthodontia.

A problem of normal variation.

The question stated is in essence as follows: In what degree can the occlusal relations of the teeth and the form of the dental arch of an individual vary from that which is typical of the race and yet express the conditions most favorable to the growth, development and life processes of the whole individual organism?

(Inasmuch as the orthodontists of the future are the dental students of today, the nature of the field of orthodontia should be defined as clearly as possible to the undergraduates. It should be given to them in its true light, presented as plainly as possible, defining the limits of knowledge relative to the problem in its present state of development. The undergratuate should be made to realize that the diagnosis of deformities involves something more than the recognition of an irregular alignment of the teeth, and that treatment instead of being merely a question of the mechanics of tooth movement is an attempt to influence developmental processes and functional activities which are perverted. Tooth movement is a simple matter; the correction of maxillary deformity is a complex problem.)

Define Normal.

First: as it refers to a standard determined by the constancy; the prevalence; the frequency of the occurrence of a condition in different organisms of a species. A standard of numerical frequency.

Second: as it refers to a functional standard expressing a balance of the functional activity of a part which is best suited to the life adjustments of the organism as a whole. The individual organism is the unit, and the normality of any part, from the standpoint of medicine, is determined by the life processes of the organism as a whole.

Definition of Individual.

(The necessity of a clear idea of the meaning of the word normal is desirable in all branches of medicine and especially so in orthodontia

where morphological evidence is the principal indication of functional conditions.)

Law of Variation.

Nature.

1. Qualitative.
2. Quantitative.

Manner of Occurrence.

1. Continuous.
2. Discontinuous.

Difference in structure.

1. Size.
2. Shape.
3. Organization.

Difference in growth, development, and functional processes.

1. Physiological Age.
2. Rates of growth.
3. Tooth eruption, etc.

(The course in anatomy treats of the typical forms and relations of structure while the study of the Law of Variation brings out the fact of individual differences which are recognized and vital in the practice of any phase of medicine. Knowledge of differences of structure applies in all surgery and restorative work and in radiography; knowledge of physiological differences in growth and development processes, in pathology and orthopedia. The Law of Variation is a basic principle in the concept of the normal. In order to recognize abnormal tendencies, pathological or developmental, in their incipient stages a knowledge of normal variation is essential.)

Dental Structures in Race History.

Teeth are the primary factors in the evolution of the jaws.

Evidence in Modern man of a process of evolution of dental structures.

General biological principles apply to all living things.

Phenomena of human life not all comparable to lower animals as man is subject to different forces of selection. Occlusion not so vital to existence.

(The object here is to bring out as clearly as possible the value of the teeth in the economy of the whole organism. A correct philosophic viewpoint is the foundation of scientific dentistry, and of course is essential in whatever branch of work the student may elect.

In the extreme specialization of dentistry, so isolated as it has been in the past, unscientific values have been attributed to the teeth. A review of the evolution of dental structures helps to connect the teeth with the rest of the organism, and emphasizes the fact that the value of a tooth is determined by the relation it bears to the functional activities of the whole organism in the adjustment of life.)

Embryology of the Face and Jaws.

A basis for the interpretations of variations in structure. The form of structure often expresses inhibitions of the natural processes of growth and development, abnormalities being embryonic conditions retained until later life. Conditions which may be normal for one period are often abnormal for another.

Evolution of the individual denture.

Transition of the deciduous to the permanent denture.

(Embryological evidence furnishes a foundation upon which to base a difference in the nature of variations which is essential to rational diagnosis. The deciduous or mixed denture is a growing, developing thing; many variations are steps in the evolution of the mature dental apparatus, and although we employ mechanics in treatment, the problem is ultimately a physiologic one. All variations in the forms of the arch and positions of the teeth are to be interpreted in terms of normal growth processes.)

Heredity.

Review of the Mechanism of Heredity.

Weismann's Theory of the Continuity of the Germ-plasm.

Transmission of Modifications.

Form of structure the result of the interaction of inherent tendencies and environment influences. Heredity determines the possibilities of development; environment stimulates, inhibits, modifies. Environment does not create. Intrinsic factors are the directing force of growth and development.

Transmission of Variations. Differentiate transmission and heredity.

Mutilations. Use and disuse. Disease.

(The attempt to attribute all conditions of malocclusion to local mechanical causes is not reasonable in light of the present attitude of science in the question of heredity. It should be clear to all who profess to direct the growth and development of the living organism that heredity fixes the possibilities of growth and development while the probabilities are determined by environmental influences.

The dental student should be familiar with the problem of heredity as presented by the genetist. The "dental point of view" is often narrow and misleading because of opinions based upon observations of private practice or the infirmary clinic.)

Habit.

Tendency to repetition is a normal characteristic of living tissue.

Integrative action of the nervous system.

Development of habit movement.

1. Nature and order of stimulation.
2. Result of action.
3. Inherited Instinctive Tendencies.

Habit movements express conditions of nervous equilibrium in the growing organism.

(The importance of the care, preservation, and the scientific consideration of the deciduous denture may well be illustrated in the study of Habit and Adaptation as the natural phenomena of development. Carious teeth, premature loss of deciduous teeth, tenderness due to eruption, and irritation due to any abnormality whatsoever, any one or all of these factors in determining the habits of the masticatory apparatus will influence its development. Especially is this true in children of unstable nervous organization.)

Physiology of Dental Structures.

Teeth. Osseous. Muscular. Vascular. Nervous.

Define function as expressing the dynamic processes of living tissues. The action; reaction, and interaction of structural elements in life processes.

Bone.

Review embryology and histology as introductory to the consideration of the physiology of bone.

Significance of connective tissue structures in relation to physiologically more active parts, as muscle and nerve.

Correlation of the internal architecture of long bones with weight bearing function.

Investigations of Macewen and Oppenheim.

The form of bone is determined partly by heredity and partly by the mechanical and chemical influences to which it is subject during growth.

Wolf's Law of bone transformation.

Nature of Alveolar bone supporting the teeth.

Conditions which influence the growth and development of the bone.

Muscle.

Review embryology and histology.

Involuntary smooth; involuntary striped, and striped express a difference in degree of differentiation.

Adaptation due to modification of individual fibers not an increase or diminution of their number.

Physiologically more active structure than bone, hence the latter is plastic to its influence.

Muscle: nervous and vascular structures are physiologically interdependent.

Classification of Dental Structures.

Non-functional—Teeth.

Form of the teeth not dependent upon the stimulus of the function of mastication.

Transitional—Muscle, nerves and blood vessels and bone in general are dependent upon both heredity and function for development.

Functional—Alveolar bone is a truly functional structure as the teeth are non-functional.

These structures are assembled in anticipation of the function of mastication to organize and mold into a harmonious whole.

Principle of Harmonious Development.

History of the Principle. Cuvier.

Practical application of the principle in Paleontology.

Harmonious development involves the consideration of *first,* evolutionary tendencies; *second,* Mendelian characters; *third,* the fundamental unity of the organism as a whole.

Evolutionary tendencies.

Law of economy of growth.

Conditions not all comparable with the lower animals as man is subject to different forces of selection.

Mendelian character is a unit character.

Is the organism a mosaic of hereditary characters?

Organic unity.

Function of the nervous system; the blood stream; the internal secretions.

Can it be assumed that under normal conditions the individual organism will invariably evolve into an harmonious whole?

(The argument should be presented to the student that he may appreciate something of the complexity of the problem malocclusion and disharmonious development.)

Malpositions of the Teeth.

Classification of Malocclusion.

SENIOR YEAR

Demonstrations of cases under treatment by competent instructors. Selection of representative cases.

Construction of appliances upon manikin heads, and the theory of their manipulation.

Lectures: The Classification of Facial Deformities.
The Musculature of the Face and Jaws.
The Influence of Diet upon Development.
Correlative Variation.
Physiologic Tooth Movement.
Supernumerary and Missing Teeth.
Mutilation.
Anomalies in Development.

ORTHODONTIA COMMITTEE ON EDUCATION—REPORT ON TECHNIC TEACHING IN THE UNDERGRADUATE SCHOOL

By Herbert A. Pullen, D.D.S., Buffalo, N. Y.

THE Committee on Education felt that its report would not be complete without suggesting some scheme in undergraduate schools for teaching technic which would not be so distinctly *orthodontic* as to be of little value to the student who wishes to practice *general dentistry only.*

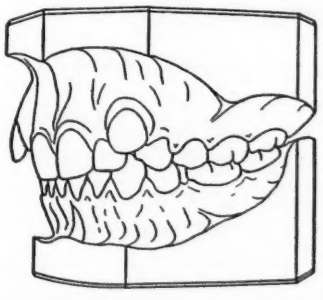
Hence a consideration of the *fundamentals* in a *technic* which would be of value to the dentist in increasing his *manual dexterity* and *visual accuracy* seemed essential.

To this end, old methods of making *threads and nuts,* drawing wire, etc., which really belong to the manufacturer of appliances, are *discarded* as of little or no value in developing *usable manual dexterity.*

The orthodontic technic which can be taught might be classified as follows:

1. Plaster technic—distinctly orthodontic in its perfection.
2. Soft soldering technic—not distinctly orthodontic—but not taught to any degree in dentistry.
3. Hard soldering by hand—distinctly orthodontic.
4. Wire bending—with *flat* and round nose pliers.
5. Construction of incisor, cuspid, bicuspid and molar *plain* bands on prepared *artificial stone* or *metal* casts.
6. Construction of simple { labial / lingual } appliances on artificial stone casts.
7. Operative technic on manikin head.

ORTHODONTIA TECHNIC—JUNIOR CLASS SCHEDULE



PLASTER IMPRESSIONS AND CASTS

1. HYGIENIC AND PROPHYLACTIC STEPS.

a. Cleanliness of the hands.
b. Clean office coat and towels.
c. Sterilized instruments.

2. PREPARATION OF PATIENT.

a. Patient seated upright.
b. Chin level with operator's *elbow* for upper impression.
c. Chin level with operator's *shoulder* for lower impression.
d. Prophylaxis of patient's mouth before taking impression.

3. TAKING THE IMPRESSION (Upper and Lower).

a. Selection and trial of impression tray in mouth.
b. Mixing of the impression plaster.
c. Distribution of plaster in impression tray.
d. Filling buccal and labial spaces with plaster.
e. Insertion of filled impression tray in the mouth.
f. Removal of surplus plaster from sides and end of tray.
g. Removal of tray.
h. Grooving of impression.
i. Fracturing and removal of impression in labial, buccal and lingual sections.

4. LABORATORY TECHNIC IN PRODUCING CASTS.

a. Drying, assembling and beading impressions.
b. Application of color and separating mediums.
c. Mixing cast plaster and pouring the casts, using camel's hair brush.
d. Inversion of filled impression on glass slab.
e. Sectioning impression shell to color medium horizontally and vertically.
f. Removal of sections in order—buccal, lingual and labial.
g. Burnishing of section lines and repairing defects on anatomical portion of casts.

5. TRIMMING OF CASTS BY ACCURATE METHODS.

a. Leveling lower cast with knife and plane.
b. Use of triangle chart for outlining standard patterns.
c. Drawing of pattern on base and capital (lower and upper casts).
d. Trimming casts to prescribed patterns.
e. Occluding upper cast to lower and leveling plane of capital.
f. Back of both casts in same vertical plane.
g. Vertical planes on all sides of base and capital.
h. Rounded front on lower cast and angular point on upper cast.
i. Beveling of surface angles of base and capital.
j. Numbering of finished model on front of lower and back of upper cast.

6. COPY DRAWING OF OCCLUDED CASTS ON DRAWING PAPER.

Name.....
Accepted.....

Fig. 1.—Schedule Plaster Technic

The technic work should be confined to the Junior and Senior Classes, and should be preferably taught by a *Schedule* system arranged with detailed steps of procedure, each step being accepted and marked when finished by the demonstrator. An illustration of the schedule for the plaster technic is shown in Fig. 1.

The *Schedules* should be self-explanatory as far as possible and each piece of technic should be illustrated on the schedule card according to scale measurement to secure uniformity and accuracy.

The object of the technic work should be not to make orthodontic specialists but to train the student in *manual dexterity* and *visual accuracy* along lines

that will be of as much value to him in dentistry as in operative orthodontia should he elect to specialize.

JUNIOR TECHNIC

Schedule A—*Plaster technic.* Step method of teaching. Drawing completed casts in occlusion after zinc etching. (Fig. 1.)

Schedule B—*Soft solder technic.* Solder pieces of wire solder together in form of circle, hexagon and square. *Draw pattern.* Sample of hexagon shown in Fig. 2.

Schedule C—Soft soldering circle, triangle and hexagon with internal cross members. Draw pattern. Sample of triangle shown in Fig. 3.

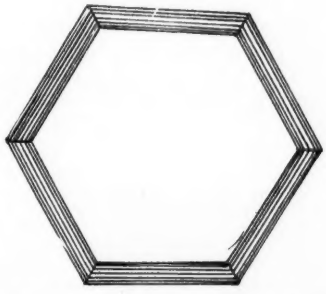


Fig. 2.—Sample of one of the forms of Schedule B. External diameter 2 inches.

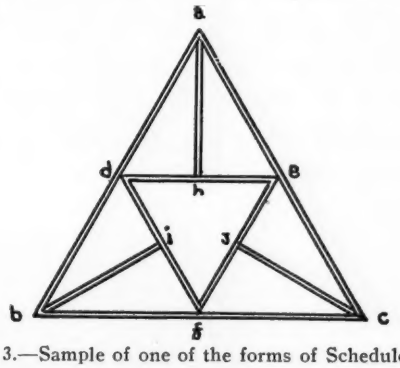


Fig. 3.—Sample of one of the forms of Schedule C.

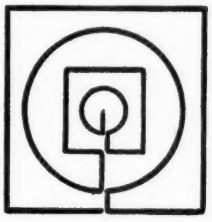


Fig. 4.—Sample of one of the forms of Schedule D.

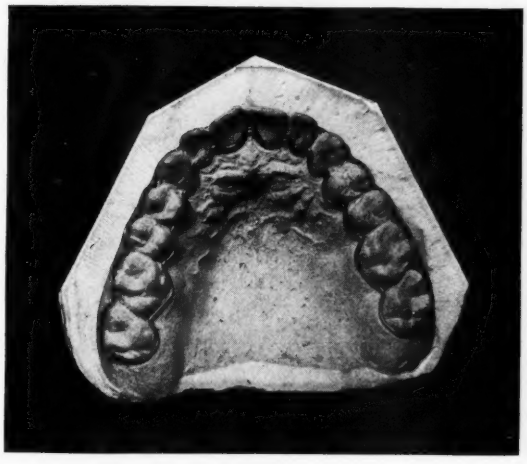


Fig. 5.—Schedule.

Schedule D—*Flat and round nose pliers* used in bending wire into various geometrical forms. Draw pattern. Sample of circles and squares shown in Fig. 4.

SENIOR TECHNIC

Schedule E—Incisor Band technic. Molar Band technic with hard solder unions.

Schedule F—Fitting *single piece* of wire entirely around dental arch following gingivae buccally and lingually and uniting at end as shown in Fig. 5.

Schedule G—The construction of simple appliances on casts or manikin.

Operative Clinic—Conducted by demonstrator only.

PARTIAL ARTIFICIAL DENTURES IN CASES OF MISSING DECIDUOUS TEETH*

By Carl O. Engstrom, D.D.S., Sacramento, Calif.

At our session a year ago I showed to some of the members of this Society the plaster casts of a little girl seven years of age who was missing her mandibular deciduous molars. As I promised at that time, I will again present the case, explain the treatment and the results. In introducing the principle of the use of artificial teeth in cases of loss in masticatory function caused by the absence of deciduous teeth, I will show another case which is of a kind not so unusual in practice. In view of the present contentions relative to focal infection and infections in general, this means of restoration

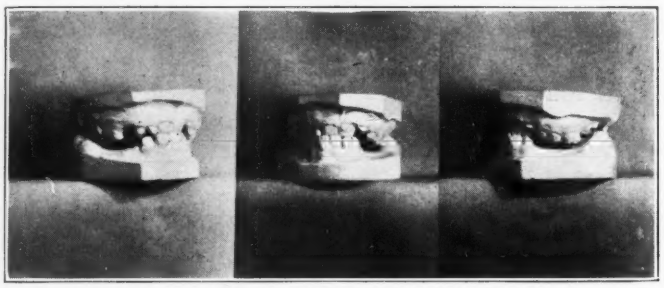


Fig. 1.

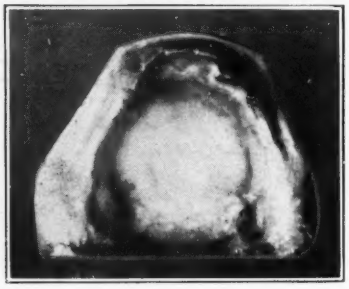


Fig. 2.

may be deserving of your serious consideration. Besides pathologic consequences, loss in masticatory function due to the absence or premature loss of deciduous teeth is of considerable significance in proper development; coincident, as it happens, with a stage in life upon which rests in no small degree the future welfare of the individual. The loss of function occurring in cases of malposed teeth is no greater a factor in fundamental growth than is the absence or premature loss of deciduous teeth. The value and the use of artificial dentures for children rests with the orthodontist who is well equipped with orthodontic knowledge.

*Clinic before the Pacific Coast Society of Orthodontists, Portland, Oregon, Feb. 16, 1921.

The first case is that of a girl seven years of age. You will note by the casts (Figs. 1 and 2) that the mandibular left canine is the only deciduous tooth shown in the mandible, and that all molars are missing. However you will note the presence of permanent mandibular incisor teeth. You will note the maldevelopment of the maxilla, and the relative position of the anterior teeth. The radiogram showed the presence of premolars and molars widely

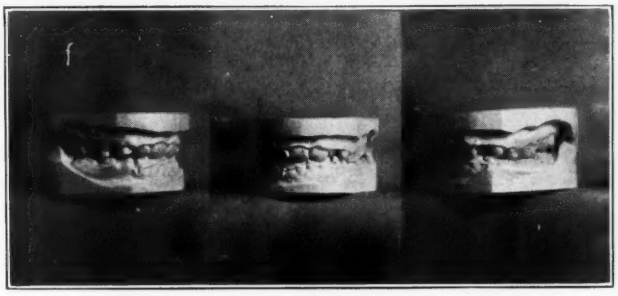


Fig. 3.

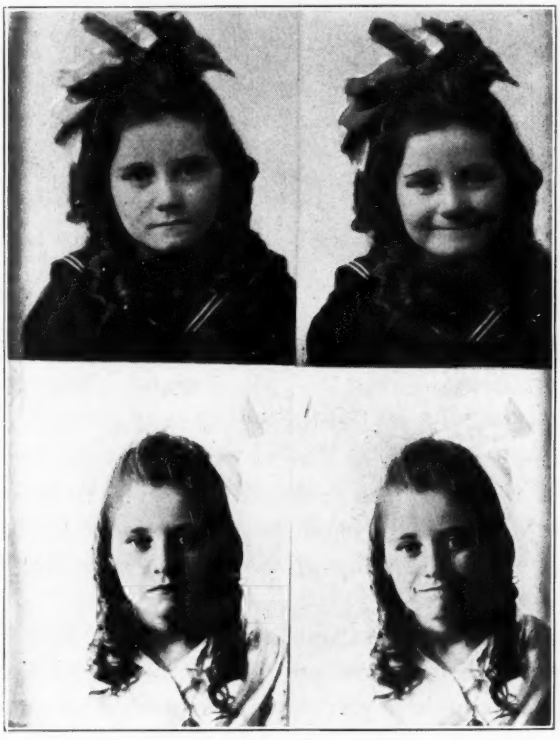


Fig. 4.

separated in the elongated mandible. Some of the missing teeth had been extracted about a year previous, others before that time. The girl suffered considerably from digestive disorders and cutaneous eruptions. These cutaneous eruptions, as I was told by the mother, were prevalent the entire year, and at times her body was almost completely covered with hives. Her nervous system was badly affected.

The general conditions prevailing in consequence of this loss in mastica-

tory function were indicative of probable serious affliction, and some restoration of the masticatory function was imperative. Therefore a partial vulcanite denture was constructed to replace the missing teeth. The anterior teeth were caused to assume positions for proper function. The casts (Fig. 3) made from a bite impression show the plate in place and the changed relative positions of the anterior teeth.

The result was a return to normal digestive function and a lessening of skin eruptions: the nervous system also improved considerably. The photographs (Fig. 4) tell their own story. Note the expression of the thin lips, similar to that of the edentulous adult. The picture on the lower right, taken during the act of smiling, shows the lips had not up to this time changed to fully conform to the altered dental apparatus.

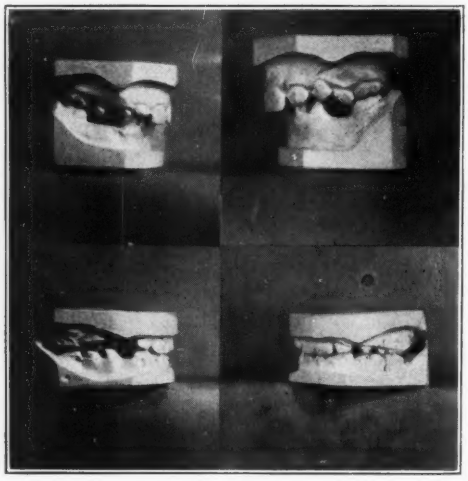


Fig. 5.

I will show you another case (Fig. 5), in which I used a partial vulcanite denture in the treatment of malocclusion as well as in restoring the masticatory function, loss of which was due to extraction of the deciduous molars. The photographs of the casts are self-explanatory. In the treatment of this case orthodontic appliances were used to cause the mandibular teeth to assume more normal positions and thereby allow for the reception of properly sized artificial deciduous molars.

A fundamental principle in treatment such as presented is that, at this stage in development, the supporting tissues of the first permanent molars should not be hindered in their physiologic growth any more than absolutely necessary by an orthodontic appliance used in the movement of teeth. From the time that the cusps of the first molars make their appearance to the time these teeth come into full function by contact with those of the opposing jaw, the alveolar process and contiguous parts are passing through a most important stage of development resulting in the attainment of the predestined purpose, the transmission of the normal force in mastication and the support of the bite. Thus is influenced vertical development during the stage of the shedding of the deciduous molars and the eruption to full function of the premolars.

DEPARTMENT OF DENTAL AND ORAL RADIOGRAPHY

Edited By

Clarence O. Simpson, M.D., D.D.S., and Howard R. Raper, D.D.S.

POSSIBILITIES IN AN ORGANIZATION OF ORAL DIAGNOSTICIANS*

By Clarence O. Simpson, M.D., D.D.S., St. Louis

THE title of this paper was chosen after a review of the published list of men responsible for the preliminary organization of the Society. Since the list of members includes practitioners of general dentistry, oral surgery, exodontia, orthodontia, and periodontia, the only common interest from a radiographic aspect, is oral diagnosis. Therefore, it seems more appropriate, and consistent with the personnel, to refer to this as a society of oral diagnosticians.

The selection of the name American Society of Dental Radiographers, appears unfortunate, and in view of the present membership, a deceptive misnomer. Authorities define a radiographer as, one who makes negatives by the use of x-rays, and when qualified by "dental," it may be defined as one who makes negatives pertaining to the teeth. This classification would include unlicensed assistants, mechanics in commercial laboratories, and demonstrators of x-ray equipment, which evidently was not the intention since graduation from college was the only qualification suggested in the advertisement for members.

Further inconsistency is presented by the list of members being composed of men who do make negatives for their patients by the use of x-rays, men who employ a girl to make negatives, men who sell negatives at a specified price, and men who do not own radiographic equipment. However, negatives made by the use of x-rays is conceded the most important factor in oral diagnosis, so there is a compatible classification for all these men under the term "diagnosticians," and a fertile field for associated endeavor. The use of "oral diagnosticians" is prompted by a regard for propriety, and not with the idea of having it adopted by the Society. The world abounds in misnomers, even when those most interested participate in the christening, so

*Read before the American Society of Dental Radiographers, at Chicago, January 18, 1922.

this Society will probably continue its existence with general speculation as to who is eligible, who belongs, and—why?

There are established societies of orthodontists, periodontists, exodontists, and prosthodontists, with membership confined to those who have limited their practice to the particular field for a specified time. The members of these societies subscribe to a high standard of ethics and proficiency, and are applying intensive study to the solution of scientific problems. Unquestionably, the importance and present status of radiodontia offers equal opportunity for organized effort. Although there are several competent men limiting their practice to radiodontia and devoting their lives to the advancement of the science, who did not have the privilege of representation in the formation of this Society: the popular conception of radiodontia accords it about the same degree of significance as "snap-shot" photography. Like photography, it is depreciated by the fact that any one can mechanically "take a picture" and continue to live in blissful ignorance of the artistic and scientific laws violated. An epigrammatist in discussing the principles of artistic composition said, "Two men are required to paint a picture, one to paint, and the other to kill him when the picture is finished." This might be transposed to apply with evolutionary advantage to radiographers, by having someone to kill them when they make a "picture," and stop without getting the information obtainable.

Matters of special interest to radiodontists are the perfecting of a systematic technic, increasing the refinement of interpretation, the collection of authentic data on physiologic variations and pathological changes in oral structures, the adoption of uniform methods in case histories and reports, the disposition of radiographic records, the training of assistants in their legitimate functions, the devising of equipment and accessories for greater efficiency, the education of dentists in the indications for, and application of radiodontic examinations, and establishing the proper professional rank of radiodontia. Men who do not limit their practice to radiodontia are not vitally interested in these specific problems, or they would have utilized more of the fundamental principles of radiodontic practice suggested in textbooks, and periodical literature. Although they may profess to practice radiodontia in connection with other specialties, or general dentistry, their chief concern in radiography is getting passable radiograms with the least trouble and greatest profit to themselves. Engrossed in operations of entirely different character, the radiogram is a mere adjunct as it pertains to diagnosis, operative procedure, and postoperative results, with little consideration being given to the comparative excellence. Admitting they do desire improvement, especially facility in radiography, they are content to wait until others accomplish it. However, the study of diagnostic and operative methods does appeal to the conscientious radiodontist, for he must consider them in his examinations and reports, and in proportion to his knowledge of the optional treatment, can he be of service in the examination.

If this preamble conveys the ideas intended, it becomes evident that a society of oral diagnosticians may be composed of men seeking information

about dentition, malocclusion, caries, pulp complications, periodontal lesions, and pathological alveolar involvement, in all of which radiography is essential. Correct diagnosis is credited with being the most important factor in the successful practice of medicine; is it any less important in the successful practice of dentistry? In the study of diagnosis, there is a distinct advantage in the collaboration of men from different branches of practice. Probably all of you have had the experience of obtaining valuable information in perplexing cases, from the viewpoint of someone in another branch of practice, or even another vocation.

Assuming that this organization of oral diagnosticians, through a common interest in radiography, will continue to exist under the name of Dental Radiographers, there are some principles of service, ethics, and dignity, which it should foster. With the avowed purpose in a published statement, of advancing dental radiography as a science and specialty, there are obvious recommendations which should be incorporated in the constitution and by-laws of this Society. Not in the form of debatable generalities, but in a concise, unmistakably worded code regulating the ethical phases of the practice. Sporadic criticism, and appeals to professional ideals have not, and will not prevent incompetent exploitation, or commercial abuses in radiography. Laws do not stop crime, but they reduce it by defining the limits wherein the disregard for the rights of others becomes a public menace, and by prescribing penalties for those who offend. The regulations of this Society will not eradicate the prevailing abuses, but they will serve as a definite guide for all who desire to conduct themselves decorously, influence opinion regarding honest service, provide a basis for legislation, and through eligibility to membership, will distinguish the commendable from the unworthy. A prominent member of the National Association of Dental Examiners, has publicly stated that the Association would have laws enacted to regulate the practice of radiodontia, when they had an authoritative standard.

Doubtless, many will concur with most of the recommendations offered, but object to those which interfere with their convenience, or questionable source of income. However, it is not a matter to be decided by individual preference, but by that which is essential to improve the character of radiodontic service, maintain the dignity and prestige of the dental profession, and elevate the professional standard of radiodontic practice. It is believed that the following suggestions are obviously for the welfare of the public, and the profession in general.

(1) Only a licensed dentist or physician is legally qualified to make a radiodontic examination. Because the laws of all states require a license from the State Board of Dental Examiners to practice dentistry, with limited exceptions for licensed physicians, and the manipulation of a patient for the purpose of diagnosis or treatment constitutes the practice of dentistry in the meaning of the term. Because the insertion of foreign materials in the mouth, subjection of the patient to the dangers of high voltage electric current and destructive radiation, and obtaining diagnostic data entails a greater risk than the average dental operation.

(2) A dentist who permits an unlicensed assistant to make a radiodontic examination is an accessory to a violation of the law and does not fulfil his obligations to the patient. Because a dentist is legally responsible for the acts of his employees in operations upon patients in his office. Because a person not qualified to practice dentistry is not legally qualified to make a radiodontic examination. If conditions prevent the dentist from making the examinations and he wishes to give this service, he should employ a dental graduate instead of capitalizing cheap labor.

(3) The practice of radiodontia should be conducted under the name, or names of the operators making the examinations. Because the laws of most states prohibit the practice of dentistry under any name except that of licensed dentists. Because it places the responsibility of practice upon licensed operators. Many x-ray laboratories are incorporated for the purpose of evading malpractice litigation and to give immunity to the individuals.

(4) It is unprofessional to give or offer commissions for patients referred, to solicit practice, or to influence the reference of patients by gifts. Because it is dishonest to exact a fee in excess of the valuation of the service by the operator for the purpose of bribing confederates. Because gifts of viewing devices, desk ornaments, etc., are merely a cheap method of soliciting practice and a breach of professional conduct.

(5) It is unprofessional to display signs or insert a statement in any publication, announcing the specialty practiced or the use of x-rays in dentistry. Because signs or public announcement of special practice or methods are intended to attract patients, and a fundamental of professional ethics is the treatment of only such patients as apply to the practitioner. Because the announcement of x-ray service in dental practice is a claim of methods presumably superior to neighboring practitioners. There is no ethical distinction between the signs, "Diseases of Men," "Extraction of Teeth," and "Dental X-Ray." The latter is the most objectionable of the three, because it has no meaning. From an ethical aspect there is no difference between advertising by signs, "Piles Cured Without the Knife," "Painless Dentistry," "Teeth Filled by the Aid of the X-Ray," and "Dentist, and Dental Roentgenologist." The fellow who advertises to cure piles without the use of a knife may use button-hole scissors, and the dentist who advertises x-ray dentistry may use it to impress the patient but not to prove the efficiency of the operation after it is performed.

(6) Basing the fee for radiodontic examinations on the number of films promotes inadequate service and is an unprofessional procedure. Because it places a monetary restriction upon the thoroughness of an operation, the undertaking of which obligates the operator to perform to the best of his ability. Because it lowers a professional service to the plane of a commercial transaction and is designed to deceive the public.

(7) It is unprofessional to advertize fees, special methods, or extraordinary skill to the profession or public. Because patients are not expected to judge the relative value of professional service, and advertisement of fees is intended to attract practice by underbidding. Because competitive advertizing is undignified and destructive to professional ideals.

(8) It is the duty of all practitioners of radiodontia to retain radiographic records of all cases examined. Because, possession of the radiographic records is a protection to the patient, the conscientious dentist, and the competent physician.

Example A. A dentist attempts a canal operation in a strategically important tooth previously treated, and during the treatment announces a perforation or fracture of the root. The radiographic records are lost, and the patient wonders which dentist erred. The shyster lawyer only inquires which dentist has financial resources and an enviable reputation.

Example B. A physician finds serious symptoms of focal infection and has a radiodontic examination made. Teeth are removed upon his advice, and the patient magically recovers—or dies. The family dentist states there was no evidence of oral sepsis, and the radiographic records are lost.

Too little importance is attached to radiodontic records, most doctors are careless in their filing system, and patients are inclined to consider radiograms as a momentary curiosity. The radiodontist has frequent requests to loan duplicate films after the originals are lost, the patient changes dentists, or someone wants to see the records without consulting the custodian. If the radiodontist submits to this imposition, and attempts to keep his files intact, he encounters many annoyances. It entails a memorandum of the circumstances, usually a reminder to the doctor to return the films, and often the ultimate loss of the records. Dentists should insist upon retaining the radiographic records of their cases to observe results, and for his protection.

(9) Dentists who do not make routine use of radiographic examinations, and fully cooperate with physicians in the eradication of oral sepsis, are not fulfilling their obligations to the patient. Because there is abundant evidence of serious results from dental operations performed without the essential radiographic information. Because dentists are prone to utilize x-ray examinations only in emergencies and oppose physicians in the investigation of oral sepsis. Some dentists are still devotees of the ancient sport of digging holes, and filling them, without regard for general oral conditions or the health of the patient.

These suggestions are offered, not with the motive of destructive criticism, or to impose personal opinion upon the policies of this Society, but from a sincere desire to advance the practice of radiodontia, and increase its benefit to humanity.

RADIODONTIC RIDDLES

Conducted by Clarence O. Simpson, M.D., D.D.S.

A Department Devoted to Discussion of the Scientific, Technical, and Ethical Problems of Radiodontia

A "Full Mouth," but Room for Improvement

Q.—Having heard of your using sixteen films in radiographing the teeth, I want to ask why so many are supposed to be needed. I call ten films a full mouth, and seldom have to take more.

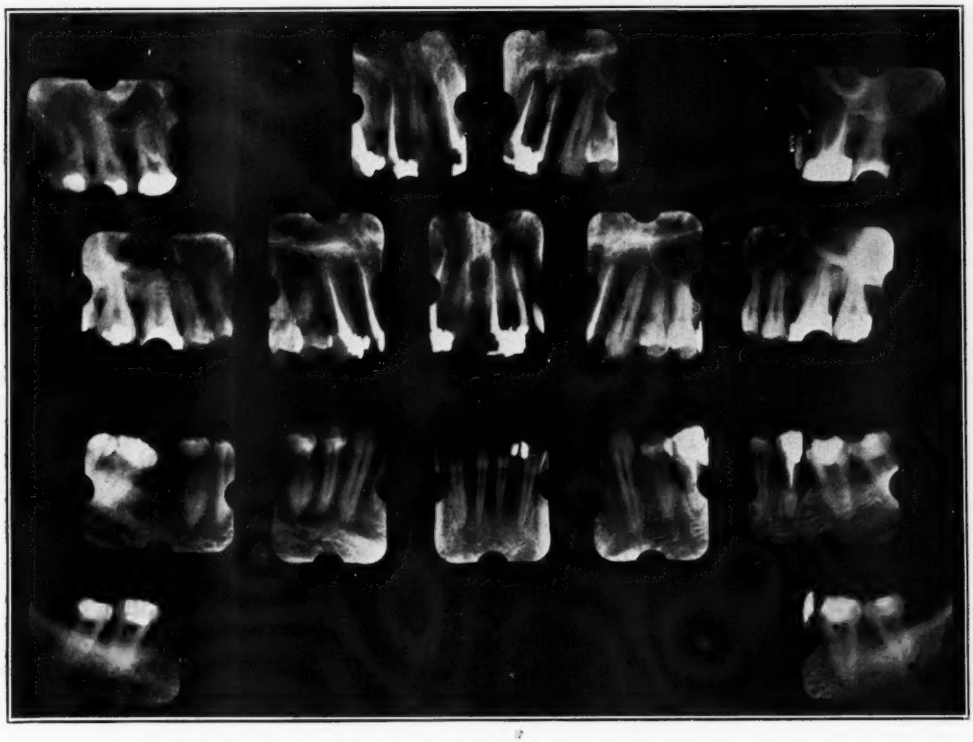
A.—Congratulations, Brother, you are contented, and contentment is a munificent blessing. You are also to be envied for your confidence in making a radiographic examination of all the teeth on ten films, and having few failures.

Since there is a possibility of your faith in the omnipotence of a ten-film panorama being shaken when you become more discriminating, and because the question has an important bearing on radiodontic service, the advantages of a more thorough examination will be described. Your expression "full mouth" is highly descriptive, for the result of an attempt to radiograph all of the teeth on ten films usually suggests a mouth full of teeth, in extreme malposition. The plan of limiting the examination to ten films, necessitates getting the desired information from a single view of three or more teeth. Many important diagnostic points are obscured in attempting to get a satisfactory view of such large groups. The lamina dura may not be visible around all of the teeth, the appearance of the roots is misleading, proximal caries and deposits are hidden, and bone involvement may not be seen. Usually only one aspect of each tooth is shown, and there is no corroboration of evidence which is imperative for reliable interpretation.

The systematic division of the dental arches into sixteen areas excludes the usual confusing anatomical structures and gives two or more views of each tooth, excepting the third molars and the mandibular central incisors. The third molars are often absent, and the mandibular incisors are rarely a source of disturbance. Three views of the maxillary incisors are shown to eliminate the superimposed nasal shadows, the anterior palatine canal, and the distortion resulting from the curve of the arch. One film is allotted to each of the canines, because they are longer than the other teeth and occupy positions at the angles or sharp curves of the arch. However, in getting the canines, eccentric views of the lateral incisors and premolars are shown, both buccal and lingual roots of the maxillary first premolars are exhibited, and the mental foramina are located. The true lingual aspect of the premolars are shown

with the first molars, without regard for the second and third molars. This view usually discloses the lingual and disto-buccal roots of the first molar, with the proximal surfaces of the premolars and first molars. The second and third molars are paired for examination because their mesio-distal axes are nearly parallel, and the shadow of the malar process is usually cast anteriorly to the maxillary second molar in the exact lingual view of this tooth. This area also displays the mesio-buccal root of the maxillary first molar, and both canals in the mandibular first molar.

The radiography of the sixteen areas described should be termed a general radiodontic examination, and does not signify that only sixteen films are



An illustration of a systematic general radiodontic examination of sixteen views.

used. Anatomical difficulties and technical errors will demand repeated exposures of some areas to obtain uniform results. A radiodontic examination should not be limited to a specified number of films or the fee based on the number of films. A general radiodontic examination should exclude anatomical perplexities; disclose periapical involvement, proximal caries, marginal disturbance, and abnormalities. If you apply this lax test to your "ten-film full mouth," you will find it does not approximate a radiodontic examination, although some pompous institutions and pseudospecialists are pot-shooting these "full mouths" and fraudulently disposing of them under the pretense of a diagnosis. A general examination is not necessarily complete in that many conditions require extraoral plates, exploratory probes, or some method of localization; while for canal operations or surgical procedure an exhaustive x-ray examination of an area may be indicated. If this answers

your question of why so many films are supposed to be needed, reflect upon it, and decide whether you have been giving your patients adequate service, or merely selling films at an exorbitant price.

Fools, Differing Only in Degree

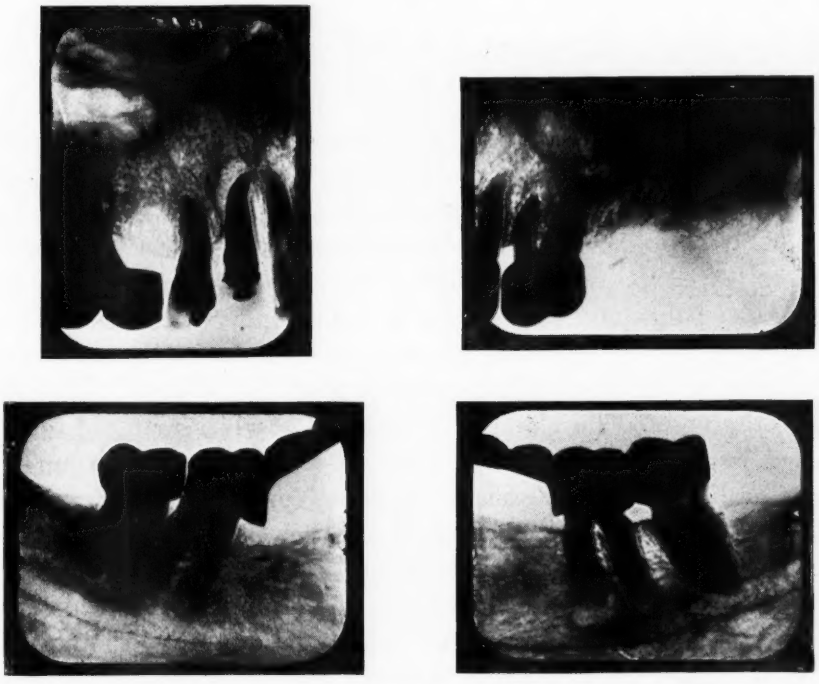
Q.—The family physician has advised one of my patients to have her crowned teeth, eight in number, extracted. I refused to do it, because none of them give trouble. Who is right?

A.—You have raised a question which opens the relationship of the medical and dental professions, and suggests a volume instead of the pages to which this dollar-a-word department is limited. As the question is stated, neither of you is right, and may a guardian angel mercifully lead the patient to some one who will exercise more intelligence. Diogenes, page Dr. Ray Diodontist. Since the physician condemned all of, and only, the crowned teeth, he probably based his decision on a smattering of oral sepsis instead of reliable evidence. After one of the medical profession (Dr. Hunter) made a gas attack on crowns, physicians are inclined to believe all crowns are a menace. A little knowledge about a thing is likely to lead to extremes. Most physicians do not know that when dental colleges were teaching it was malpractice to crown vital teeth, there were many malpractitioners doing it. Now the dental colleges are teaching vitality of pulps, but there is still a steady sale for barbed broaches. In advising the experimental removal of eight teeth (one-fourth of the dental quota, and perhaps three-fourths of the masticatory function), the physician outradicalized the biological Bolsheviki of dentistry; but he should be given credit for gameness in staking his opinion against the patient's teeth. When the advocates of the surgical removal of teeth break into medical literature, perhaps physicians will advise blasting out the crowned teeth.

You are only in the other end of the boat rocking it the same "one-born-a-minute" manner. If you had kept in touch with dental pathology, you would know that chronic infections rarely cause local symptoms. In the dark ages, before the advent of radiography, dentists believed alveolar abscess was cured when the local symptoms subsided, but the fallacy of this has been conclusively proved. No one but God and Dr. Thomas Hinman, who claims to locate 95 per cent of granulomata without the x-ray, knows whether or not the crowned teeth are "giving trouble." You and many other dentists must revise your diagnostic technic, and begin by eliminating the "giving trouble" element from your conclusions. All supporting bone around teeth is destroyed by pyorrhea alveolaris without "giving trouble;" cysts an inch in diameter, develop in jaws without "giving trouble;" and lungs are destroyed by tuberculosis without "giving trouble" by local symptoms. The "giving trouble" diagnosis has been relegated to the discard, along with the "catching cold" alibi for dental infection, and the "salivation" etiology of pyorrhea alveolaris. Radiography provides a means of accurately determining conditions around teeth, and before extracting or refusing to extract teeth you should thoroughly investigate conditions. Furthermore, by periodic x-ray and clinical examinations you should promote the oral health of the

patients who intrust themselves to your care, without being requested by the family physician. In many instances physicians have advised the removal of teeth because they could not get cooperation from dentists. When a physician refers a patient for the investigation of oral conditions, and the dentist reports that he has cleaned the teeth and found no cavities or none of the teeth seem to be giving trouble, the physician is compelled to act independently for the welfare of the patient. Some physicians display excellent judgment in dental matters, but others exhibit the veterinary standards of your colleague.

An oculist who suspected focal infection as an important factor in a rapidly failing vision advised a radiodontic examination. When the patient asked the dentist, who had recently placed two bridges in the mouth, about



Radiodontic records of a patient with rapidly failing sight. The dentist protested against the examination because the teeth were not "giving trouble."

it, he said "Your teeth are all right, it is foolish for you to have them x-rayed on account of your eyes." The radiodontic examination was made over the dentist's protest and disclosed the evidence of septic dentistry illustrated by the accompanying radiograms.

Such experiences are not unusual, and so long as they occur physicians cannot be censured for independent action. When dentists perform their operations in conformity to accepted standards, keep subsequent developments under observation, and cooperate with physicians in excluding oral sepsis, there will be little friction between the professions. Dentistry offers a wonderful opportunity for service when full advantage is taken of its possibilities, but contemptuous reference to its mechanical limitations has had some justification in the preponderance of "journeymen" dentists lacking in professional conception.

ABSTRACT OF
CURRENT LITERATURE

Covering Such Subjects as

ORTHODONTIA — ORAL SURGERY — SURGICAL ORTHODONTIA — DENTAL RADIOGRAPHY

It is the purpose of this JOURNAL to review so far as possible the most important literature as it appears in English and Foreign periodicals and to present it in abstract form. Authors are requested to send abstracts or reprints of their papers to the publishers.

Value of the Animal Experimental Method in Dental Research. Mrs. Mellanby (Liverpool). The Dental Record, January 2, 1922, xlii, 1.

Some of the paradoxic conditions which obtain in our knowledge of the teeth are contrasted by the writer. It may be the person with the clean mouth who suffers from extensive caries, while the dirty mouthed subject may have sound teeth. Certain dark races violate all the laws of dental hygiene and yet have perfect teeth; those who eat soft and pappy food may have better teeth than those who habitually masticate. It is evident that these mysteries cannot be solved save through experiment. According to the laws of heredity those who have good teeth should transmit them to their posterity, but this is not always the case. The claim that caries is a white man's disease only is antagonized by the statement that a negro or Esquimaux suffers from this affection if he lives as a white man. In New York some of the negroes have teeth as carious as those of the nearby white. In studying the factor of hygiene as distinct from diet—bad housing, poor ventilation, lack of exercise for months—this does not induce caries in the Esquimaux or white natives of the Western Hebrides, and, as pointed out above, diet alone cannot determine caries with certainty. It is possible in theory but not in practice to experiment on mankind but it would mean a restricted diet for months and expensive studies of metabolism. The rapidly maturing and ageing dog is far better adapted to experiment and can be dieted on exclusive food articles without hardship. The writer, whose husband has made well known studies on animal rachitis, was in position to use his material and conducted experiments on about 300 puppies. Diets were selected largely by vitamine content and studies were made on the histology of the teeth in dieted and other animals. The writer has made the discovery that a diet however abundant, balanced and assimilable, but without the fat soluble vitamine, is followed by imperfect calcification of the jaw bones and alveolar processes, which in turn results in imperfect alignment of the teeth, especially the lower incisors. There is further a delay in the eruption of the temporary teeth and a slower evolution of the permanent. Again there is delay in calcification and defective enamel with relatively small amount of dentine. An indirect result of deficiency in fat-

soluble vitamine is lowered resistance to disease. Foods which guarantee the needed vitamine comprise cod liver oil and most animal fats excepting lard, whole milk and cheese made from the same, and butter. Green foods of course as the original source of vitamine abound in the latter and also in calcium, but could not be tested on puppies. The older diets recommended by dentists of the previtamine period were, singularly, lacking in most of the articles enumerated above, although they contained raw fruits and the raw salad vegetables.

Fracture of the Mandible at the Seat of a Bone Phlegmon of Dental Origin. Nogue et Bibard. La Revue de Stomatologie, September, 1921, xxiii, 9.

The patient was 45 years old and consulted the authors for 6-year molar trouble to the right. This was found to have caries with necrotic pulp. The cavity received a temporary filling with cement and when seen three days later the tooth was found loose with an osteoperiotitic tumefaction of the gum; it had not ceased to ache since the filling. Extraction was at once performed without an anesthetic. Seen again four days later patient reported that pain had never ceased. The adjacent bicuspid was extracted, as it was carious, and came away readily. The osteoperiostitis continued its evolution unchanged and a collection of pus in the submaxillary region resulted and was evacuated. Pus could be squeezed from the alveoli and the curette was used. On the day following the curettage the patient noted that his lower jaw was unduly mobile and it was found that a complete fracture had occurred at the level of the 6-year molar. The existence of sequestra was assumed which would naturally interfere with union if the fracture were set. After an x-ray had been taken the curette was used under general narcosis and a number of sequestra, one as large as a hazel nut, were brought away. The mandible was now immobilized and resolution took place with the exception of a small external fistula. No constitutional condition was found to account for the fracture. This accident is a very infrequent complication of odontogenic phlegmon of the mandible. Some of the larger reference works do not mention it. It would be termed a quasi-spontaneous fracture, for while there was no typical external violence to explain it, such a possibility could not be wholly excluded. Perhaps it was as nearly spontaneous as any fracture can be. The process of sequestration did not involve the width of the mandible, although the underlying inflammatory condition may have made the bone so friable that muscular action sufficed to break it.

Novocain Dermatitis in Dentists. C. Guy Lane (Boston). The Dental Cosmos. September, 1921, lxiii, 9.

The author is a dermatologist connected with the Massachusetts General Hospital. In certain predisposed individuals an eruption after due exposure to novocain begins on the hands, at times between the fingers, characterized at first by slight redness, with itching or burning. While the entire hand may be involved the dorsal surface is the area of preference. The redness may be

succeeded by crops of vesicles which may be partly the result of scratching. Later manifestations are crust formation, fissures and involvement of the nails. This dermatosis comes under the head of an occupation disease—a dermatitis or eczema of occupational origin. That the condition comes about through local contact and not from absorption appears from the fact that it disappears upon removal of the irritating cause and that one may work with rubber gloves with impunity. The author narrates two severe cases in which novocain was found to be the offending substance, out of a number which the patient handled. In the severe case the dentist becomes unable to work and on laying off, the condition vanishes without the use of special skin alteratives. It is readily shown that the first appearance of the eruption is the point of contact with the novocain solution, but in the extension of the dermatitis some other factor must be responsible. One thinks in this connection of a possible parasite, or of a process of sensitization of the skin of the hand. No parasite has been isolated and if the unknown factor were anaphylaxis there ought to be a general reaction as well as local. Delay in the development of the lesions after exposure is evident and this fact speaks against anaphylaxis. Again not one dentist with the dermatitis had ever had novocain used on himself.

Contacts with the novocain solution occur in a variety of ways—from the barrel of the syringe, from the needle, from the patient's mouth. Comparison of the novocain dermatitis with similar affections does not aid in the solution of the problem. Other local analgesics have behaved in a similar manner, but only to a slight degree. Occupation dermatitis does not show much type and in each case the condition is autonomous to a large extent. Urotropin *per se* causes rash on handling, but in the process of vulcanization it appears to set up a dermatitis of occupation. Close study appears to show that this eruption is due to the incidental formation of formic acid. But novocain cannot be shown to form any other irritating derivative, for it is naturally stable and there is nothing to render it unstable in its dental use. The author naturally tested the skins of his patients intradermically for the presence of novocain intolerance and in all cases obtained the local reaction—once in a few minutes but otherwise the reaction would be classed as delayed. Under the head of treatment nothing further can be said. The only cure is to keep the skin protected and this is also, of course, the prevention as well. The percentage of dentists to develop novocain dermatitis is very small. It would appear to the reviewer that scratching is the factor responsible for the extension of the disease over the hand, as according to the author, the puritus may be intense. We find no statment as to whether the diffusion is equally present if itching is not a conspicuous phenomenon.

A Consideration of Impactions. R. P. McGee (Pittsburgh). The Dental Cosmos, December, 1921, lxiii, 12.

The subject of the eruption of the teeth is not yet fully understood. An impaction is a condition in which eruption of the tooth is hindered; it may be temporary or permanent and may also be incomplete. There may be a traumatic cause and the mandible is more exposed to traumatism than any other

bone in the body, although the clavicle is often put before it in this respect. A mere blow on the lower jaw is known to have interfered with its development. Fevers may also interfere with calcification, as may unusual anomalies of dentition. Disturbance of calcification may consist in irregularity of deposit which favors impaction. Again a condensing osteitis is set up about any devitalized tooth. This has been demonstrated by measuring the elasticity of living and dead teeth. Indurations of the maxillæ come from a variety of causes: injury, fever, etc., often the causation is obscure.

It is the impacted cuspid rather than the impacted third molar which is the more frequent cause of nerve reflexes. A case is cited of a cuspid tooth impacted in the center of the roof of the mouth; the subject had been insane for four years when the accidental x-ray discovery led to an operation, which was the means of restoring him to his former business activities.

So much error has crept into the fundamentals of dentistry that it is often more profitable to go back a hundred years than ten years. The author here cites the remarkable prescience of John Hunter whom he calls the founder of scientific dentistry. Hunter seems to have known more about the teeth than any of his successors for 75 years, and his knowledge of eruption is not inferior to our own.

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EDITORIALS

Some Thoughts on the Study of the Etiology of Angle's Class II Malocclusal Manifestations

EDITORIAL consideration is given the paper dealing with "Studies on the Etiology of Angle's Class II Malocclusal Manifestations," because the editor was prevented from discussing the paper at the time it was given before the society, and because it contains some statements of facts that may be interpreted in a slightly different way than the author of the paper interpreted them.

As far as posterior occlusions are concerned, the author seems to lean to the idea that mouth-breathing, diseases of the nasal passages, adenoids and tonsils have very little to do with the production of the deformity, or in fact with any other malocclusion. While it is possible that we may find fin-

ger, tongue, and lip sucking habits in a large number of children who present malocclusions, it is also equally true that we find finger, tongue, and lip sucking habits in just as many more children who do not have malocclusions.

This statement is made because of the editor's association, during his medical student days, with a number of children's hospitals in the Middle West and with men who have devoted their lives to the treatment of children's diseases and have seen so many patients with the above habits who do not possess deformities.

We know of many individuals who have been lip, finger and tongue suckers for years even during adult life, who have never developed malocclusions. Therefore, we are inclined to believe that finger, tongue and lip sucking habits do not always produce malocclusion. In other words, lip sucking in the majority of cases simply happens to be a nervous manifestation which is the result of a cause and this cause may be a factor which predisposes toward the malocclusion. We have seen but few cases during our years of private practice and clinical work that we feel were influenced to any great extent by finger, tongue, and lip sucking habits. Many cases have come to our observation which have convinced us that a series of pathologic conditions of the nose and nasopharynx were very largely responsible for the production of the malocclusion.

It has been our fortune during the past twenty years to have been closely associated with the practice or teaching of orthodontia on the Pacific Coast, in the Middle West, and the region of the Great Lakes and on the Atlantic Seaboard. The prevailing types of malocclusion differ greatly in different localities. In the region of the Atlantic Seaboard and the Great Lakes with the cold winters and the sudden changes of temperature, we find many adenoids, hypertrophied tonsils, diseases of the nasal cavities, and similar conditions which produce mouth-breathing and abnormal muscular actions. These cases are more numerous than in the Middle West and on the Pacific Coast. In the southwestern region where the individual is subject to high temperature, long summers, and mild winters, the inflammation of the nasopharynx, adenoids and enlarged tonsils are a rarity and the number of posterior occlusions are also very small. While in private practice in Kansas City and also in the clinic at the Kansas City Dental College, posterior occlusions were far in the minority, in the clinic in New York they have a high average. We do not believe there are any more individuals with finger, tongue or lip sucking habits in New York than in Missouri, but there are more cases of adenoids and enlarged tonsils and more mouth-breathers. Therefore, our observance is at variance with Doctor Hellman's, and until he has made examinations in different localities, we cannot accept his opinion that mouth-breathing and inflammation of the nasopharynx, adenoids, and diseased tonsils do not play a greater part in the production of malocclusion than finger, tongue and lip sucking habits unassociated with mouth-breathing.

Doctor Hellman is inclined to believe that mouth-breathing plays a very little part in the production of posteroclusions with linguoversion of the maxillary incisors, or the so-called "Class II, Division 2." We will admit that such

cases as he cites as being posteroclusions with linguoversion of the maxillary incisors or "Class II, Division 2," are not influenced very much by the mouth-breathing, because these *cases* cited are not posteroclusions, as is shown in Figs. 1, 2, and 3, and also in his description of the development of the maxilla and mandible of this particular case.

The influence of muscles and improper function which occurs in mouth-breathing cannot be waved aside so easily. Dr. Rogers in his papers further proves this by setting forth the results obtained by giving special attention to producing a tonicity of the muscles which come into normal function with normal breathing. The proper actions of the muscles of expression, respiration, and deglutition are interfered with in mouth-breathing, and they play a much more important part in the production of posteroclusion than do habits.

Individuals who are suffering from adenoids and enlarged tonsils are very apt to form the habit of sucking the finger, thumb, lip, or some other object. Among men limiting their practice to the diseases of children the habit of sucking the thumb, blanket or some other object, is considered a symptom of enlarged lymphatic tissue in the nasopharynx. In fact we have known physicians who were willing to make a diagnosis of adenoids on the fact that a child persistently sucked. The anatomic location of the pharyngeal tonsil is posterior and above the soft palate. The nasopharynx is blocked by this mass of lymphatic tissue growing downward and forward against the soft palate. During sucking the soft palate is pulled forward and a greater space is created between the soft palate and the pharyngeal tonsil and therefore the child is enabled to breathe more freely. The base of the tongue is also pulled forward, increasing the space in the fauces and thus allowing the individual to breathe easier. In a large number of posteroclusions and other malocclusal manifestations where there is inflammation of the nasopharynx and adenoids and enlarged tonsils, the youngster will be a finger sucker, but these habits are the result of a cause, often removed by the cleaning out of the nasopharynx so that the child can breathe properly.

Owing to the fact that Doctor Hellman has found so many sucking habits in the cases he has investigated, he has permitted himself to become enthusiastic on that subject. This is proved by his paper in which he says "I do not know whether this habit is acquired during labor or immediately after birth or before birth." For a number of years we gave our attention to anatomy and also spent some time in studying embryology and reading books on that subject, as well as obtaining information by dissecting embryos. In the face of that experience we are unable to understand how it is possible for a child to suck his finger or thumb or lip before he is born. Sucking and respiration cannot take place *in utero,* therefore such a thing as the sucking habit before birth is absolutely impossible.

In regard to the theory advanced by Doctor Michio Inouye that the hands are employed in pressing the mandible downward during the formation of the palate, we can only say that there is no evidence to substantiate it. As the embryo develops in the uterus the hands may assume a position close to the mouth because of the anatomic association of parts and because the arms must

be folded somewhere. This does not mean that the fetus is sucking its thumb or that the hands are depressing the mandible during the formation of the hard palate.

Doctor Hellman's inferences that posteroclusions may be the result of inharmonious developments or disturbances of growth during a certain period, is interesting and probably possesses some truth. However, his statements that cleft palate and harelip are the result of the improper size of the parts is not exactly true and, in fact, is not true in the majority of instances. In most cases of harelip and cleft palate that we have seen, and the observation of other men is the same, there is a sufficient development of those structures but, for some reason or other, a failure of union. The nasal buds, which carry the maxillary incisors, most often are of full size. The palatal processes of the superior maxillary bone are generally fully developed, and they failed to unite because of improper position.

Doctor Hellman states that in many of these cases teeth are missing and deformed. He undoubtedly has mistaken the deformed teeth which he has seen after the surgical operation as the original condition. Doctor Federspiel has long contended that the so-called "Brophy Operation" produces great damage to the tooth germs, and I simply mention this to show, as Doctor Hellman admits, that there are many factors that produce malocclusion. I believe it is an incorrect thing to attribute malocclusions to the sucking habit because that habit has been found to prevail in a number of individuals who have malocclusions when we find more youngsters with normal occlusions who suck their fingers and thumbs. Some physicians contend that sucking of the finger or thumb tends to assist in the circulation of the blood in the cranial cavity. I know that adult persistent finger or thumb suckers admit they do it when they are tired and do not have such a desire when they are not tired.

Following the influence of the sucking habits upon the human race, there are a great many men who persistently suck cigars or cigarettes. They derive a certain satisfaction from the smoke and also pleasure from sucking the cigarette or the cigar, the same as the child does in sucking his finger or thumb. We could attribute all of the ills of the human family to finger, tongue, lip, cigar and cigarette sucking habits and probably be about as correct as in attributing a large percentage of malocclusion to this habit.

The Need for More Careful Diagnosis of Malocclusion

IN this issue of the JOURNAL we publish an excellent paper by Dr. Milo Hellman on "Studies on the Etiology of Angle's Class II Malocclusal Manifestations."

This paper, like all papers written by Dr. Hellman, is the result of an enormous amount of time spent on investigation. It also shows a necessity for more careful consideration of some factors. It shows the need of a more careful diagnosis of malocclusion and the use of terms which are more explanatory than the so much used Class II, Division 1, and Class II, Division 2. It also necessitates a more careful consideration of what is really meant by Class

II, or distoclusion, as the term has been adopted by the American Society of Orthodontists. A Class II malocclusion is a condition in which the mandibular arch is posterior to normal as judged by the maxillary arch, the cranial and facial developments. In fact, when we speak of posterior relations of the mandibular arch, we are referring to posterior positions as related to the face and cranium more than we are to the maxillary teeth. Doctor Case has long criticized the Angle classification because Dr. Angle did not recognize certain possible conditions in each maxillary arch.

Certain maxillary teeth may take anterior positions and the mandibular teeth be normal anteroposteriorly. While the editor has never seen a case of all of the maxillary teeth assuming an anterior position, he is willing to agree with Dr. Case, as a scientific argument that such a thing is possible, and if the maxillary teeth were anterior, it would be entirely different from a posterior position of the mandibular arch or Angle's Class II.

Doctor Hellman in criticizing the term distoclusion calls attention to the fact that according to strict anatomical terminology, the so-called "Class II," or distoclusion, should in reality be called a posteroclusion. Now if we recognize or understand "Class II" either Division 1 or 2 according to Angle's terminology, to be those conditions in which the mandibular teeth have assumed a posterior relation to normal, we would not make the mistake of calling such cases as shown by Hellman in Figs. 1, 2 and 3, "Class II, Division 2-sub-division." This case is not a Class II, Division 2-sub-division because the mandibular arch is not posterior.

According to the terminology as adopted by the American Society of Orthodontists and suggested by Doctor Lischer, Figs. 1, 2 and 3 of Hellman's article show a case of neutroclusion with mesioversion of the right maxillary teeth. A typical Class II, Division 2, according to Angle's terminology would be a case in which the mandibular arch was posterior and in which the facial balance of the individual could only be established by moving the mandibular arch forward. Doctor Case has contended for a number of years and Doctor Lischer has also called our attention many times to the fact that: in malocclusion diagnosis, we must consider the facial outline of the patient as well as the inclined planes of the teeth. You cannot take one arch as being fixed or any one tooth as being fixed in the arch, and we should change our terminology and ideas, and realize that Class II, or distoclusion, should be called posteroclusion and should be defined as those conditions in which the mandibular arch has assumed a posterior relation to the maxillary arch as related to the face and cranium.

ORTHODONTIC NEWS AND NOTES

The editors desire to make this department a permanent feature of the Journal, but in order to do so must have the full support of the orthodontic profession throughout the country. We would deem it a great favor if our subscribers and readers would send in such announcements as might be of interest to the profession.

The American Society of Orthodontists

The Annual Meeting of the American Society of Orthodontists will be held at the Edgewater Beach Hotel, Chicago, Ill., on April 24, 25, and 26, 1922. Following is a preliminary announcement of the program:

President's Address,
Dr. Martin Dewey,
New York.

Bone Cells in Relation to Bone Growth and Repair,
Dr. Theo. H. Bast,
University of Wisconsin.

Indirect Method of Making Orthodontic Appliances,
Dr. Leuman H. Waugh,
New York.

Status Thymico Lymphaticus with Special Consideration of Growth Defects and their Anatomic Compensation,
Dr. Walter Timme,
New York.

Case Reports by:

Dr. Clinton C. Howard, Atlanta, Ga.
Dr. Lawrence Baker, Boston, Mass.
Dr. W. K. Slater, Knoxville, Tenn.
Dr. Charles R. Baker, Evanston, Ill.
Dr. J. A. Burrill, Chicago, Ill.
Dr. Ernest N. Bach, Toledo, Ohio.
Dr. Frank M. Casto, Cleveland, Ohio.
Dr. Walter H. Ellis, Buffalo, N. Y.
Dr. Harry E. Kelsey, Baltimore, Md.
Dr. Carl B. Case, Milwaukee, Wisc.
Dr. S. L. Kregarman, New York City.
Dr. R. C. Willett, Peoria, Ill.
Dr. F. C. Kemple, New York City.

Application of Spring Force from Gold Platinum Removable Appliances,
Dr. Martin Dewey,
New York.

Some Physiological Principles in Orthodontia,
Dr. Martin H. Fisher,
University of Cincinnati,
Cincinnati, Ohio.

Early Treatment,
Dr. A. H. Ketcham,
Denver, Colorado.

A Preliminary Report on Research Work being conducted by,
Dr. Milo Hellman,
New York.

A Study of Third Molar Impaction, Associated with Orthodontic Retention,
Dr. Varney E. Barnes,
Cleveland, Ohio.

Dr. A. Fernald, Boston, Mass.

Clinicians:

Dr. Leuman M. Waugh, New York City.
Dr. Norris C. Leonard, Baltimore, Md.
Dr. C. A. Hawley, Washington, D. C.
Dr. Varney E. Barnes, Cleveland, Ohio.
Dr. Carl B. Case, Milwaukee, Wisc.
Dr. Ernest N. Bach, Toledo, Ohio.
Dr. R. W. Noland, Des Moines, Ia.
Dr. George B. Crozat, New Orleans, La.
Dr. Samuel E. Johnston, Kansas City, Mo.
Dr. Lourie J. Porter, New York City.
Dr. James B. Morrison, Montreal, Can.

Southwestern Society of Orthodontists

The Annual Meeting of the Southwestern Society of Orthodontists will be held at Oklahoma City, Okla., Skirvin Hotel, April 22nd. All ethical practitioners welcome.

PROGRAM

9:00 A.M.—Address of Welcome, Dr. John Payne, President Oklahoma City Dental Society, Oklahoma City, Oklahoma.

9:20 A.M.—Response, and President's Address, Dr. T. O. Gorman, San Antonio, Texas.

10:00 A.M.—(1) Clinic—A Method of Constructing and Repairing Lingual Arches Without Removing Molar Bands, Dr. E. B. Arnold, Houston, Texas.

(2) Clinic—Some Uses for the Reverse Curve Finger Spring, Dr. W. E. Flesher, Oklahoma City, Oklahoma.

(3) Clinic—Treatment of Impacted Teeth, Dr. T. M. Robertson, Coffeyville, Kans.

(4) Clinic—Combination Lingual and Buccal Appliance for Expanding Arches, Dr. R. T. Chapman, El Paso, Texas.

11:00 A.M.—Business session.

11:45 A.M.—Luncheon—Skirvin Hotel.

Paper—Malocclusion of the Teeth and the Impending Deformities, Dr. Hugh G. Tanzey, Kansas City, Mo.

1:30 P.M.—Paper—What We Hope to Accomplish in our Efforts at Orthodontic Treatment, Dr. T. G. Duckworth, San Antonio, Texas.

2:00 P.M.—Movie—Adjustment of the Ribbon Arch Appliances by Dr. Angle, Dr. W. T. Sorrels, Oklahoma City, Oklahoma.

2:30 P.M.—Case reports:

It is the object to fill this time with the presentation and discussion of cases, which may impart information or on which information may be desired. This can be made very interesting if you will submit cases. Kindly have brief history and synopsis outlining treatment written.

3:30 P.M.—Automobile tour of the City.

5:00 P.M.—Dinner.

6:00 P.M.—All aboard, special Rock Island Pullman to Chicago. Kansas and Kansas City men will board same car enroute.

The American Society of Dental Radiographers

The annual meeting of the American Society of Dental Radiographers will be held at the Ambassador Hotel, Los Angeles, California, Wednesday and Thursday, July 19 and 20. The Program Committee has arranged for an interesting and scientific meeting. All those extremely interested in Dental Radiography are cordially invited to attend. H. C. McKittrick, President, I. O. O. F. Bldg., Indianapolis, Ind., Martin Dewey, Sec.-Treas., 501 Fifth Ave., New York, N. Y.

Notes of Interest

Dr. Walter Hyde announces the removal of his office to 434 LaSalle Building, Minneapolis, Minn. Practice limited to orthodontia.

John Edward Taylor, D.D.S., announced a practice limited to orthodontia, 6778 Hollywood Blvd., Hollywood, California.